FIELD CROP ABSTRACTS

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REVIEW ARTICLE

FODDER PRODUCTION FROM WINTER-SOWN CEREALS AND ITS EFFECT UPON GRAIN YIELD (*CONCLUDED*)

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HERBAGE PRODUCED BY WINTER-SOWN CEREAL CROPS

Animal production from winter-sown cereals

In some of the published work on grazing cereals there have been attempts to give a measure of the animal production obtained. This has been expressed in terms of milk or meat produced per acre, or in terms of animal grazing-days per acre. As in some cases supplementary feeding stuffs had also been fed it is not easy to assess the value of these measures.

The Kansas standards of stocking are given by Swanson and Anderson (1951). They are of the order of 3 – 7 acres of wheat per stock unit in the fall, 2 – 4 acres per unit in the early spring and 1·5 acres per unit in the period 10–30 April. In their experiments they calculated that moderate seasonal pasturage required 5·4 acres per stock unit in wheat following wheat but only 2·7 acres per unit when wheat followed fallow.

In Texas, Ratcliffe (1922) obtained gains of 1·6 lb. per day each on 2 steers grazing 2 acres of oats between 20 November and 11 May. Letteer (1917, 1920) reported weight gains of 1·4 and 1·5 lb. per day over periods of about a month with stocking rates of 1 steer per acre and 2 steers per 0·5 acre, respectively, oats again being the crop.

In South Africa, Van Wyk and Verbeck (1944) claimed that cereals provided maintenance plus 3 – 4 gal. in the case of dairy cows. In Nebraska, Kiesselbach and Lyness (1948) reported that wheat gave from 15 cow-days per acre with full grazing and 67 cow-days per acre in the case of late-spring grazing.

In Great Britain, (Robinson 1951), reporting the Monmouth trial, claimed 190 cow grazing-days per acre between 12 and 16 April and as much as 290 between 5 and 9 May, although no statement as to supplementary feeding is given. The heavy, late grazing led to a grain reduction of 80%.

S. W. T. Solly of Canterbury, Kent, (1956) very kindly allowed the writer to consult some carefully kept grazing records of dairy cows on winter-sown cereals. The following summarises the relevant information.

1947–8	Winter oats sown 10 Oct., 1947	
	Grazed 23 Mar.–13 April	
	Approx. 3 cows/acre	
	Cow grazing-days per acre	20
	Milk per acre	55 gal.
	Concentrates fed	159 lb.
1947–8	Wheat, barley and oats sown 25 Aug., 1947	
	Grazed 20–27 Nov. and 10–24 Mar.	
	Approx. 11 cows/acre	
	Cow grazing-days per acre. (10–24 Mar. only)	51
	Milk per acre	124 gal.
	Concentrates fed	441 lb.
1948–9	Wheat (4 varieties) sown 18 Sept., 1948	
	Grazed 10–21 Dec. and 21 Mar.–5 April	
	Approx. 10·5 cows/acre—with run-back on to grass, two-thirds credited to wheat	
	Cow grazing-days per acre	106
	Milk per acre	280 gal.
	Concentrates fed	977 lb.

Yield of forage

The yield of animal products resulting from grazing a winter-sown cereal is of course related to the yield and feeding value of the herbage produced. It is well known that the yield of plant material when plotted against time takes the form of a sigmoid growth-curve. The 'grand' period of growth in a cereal crop coincides with the development and upward growth of the ear (Norman, 1933). The early gradual slope of the curve corresponds to the period of vegetative growth during the winter months. This explains why the yield of herbage increases very rapidly in spring, the later the cuts or grazings are taken. Under British conditions it would seem from the Yorkshire experiments (Holliday and Storey, 1946) that grazings are usually taken during the period of the first change of curvature in the growth curve (see Fig. 1). In all the experiments conducted in the Yorkshire area, small yields were obtained in

the truly vegetative growing phase, in spite of the fact that many of the crops used were selected for their copious winter growth compared with normal. Peto (1952) in a detailed growth-analysis experiment obtained similar growth curves to that shown in Fig 1.

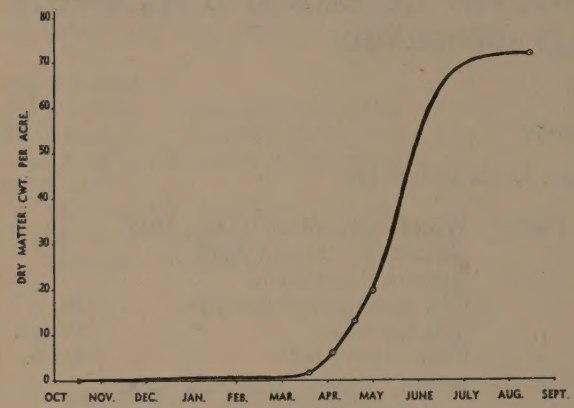

FIG. 1. Yorkshire Experiment I. Yields of dry matter from single cuts of wheat on successive dates in 1946.

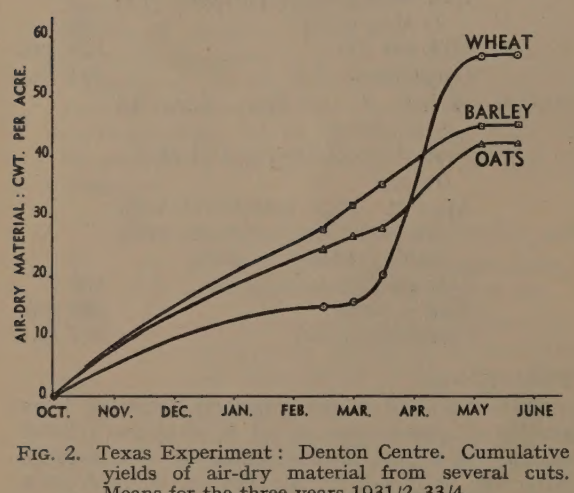

FIG. 2. Texas Experiment: Denton Centre. Cumulative yields of air-dry material from several cuts. Means for the three years 1931/2–33/4.

Quite a different ecological situation exists in some of the American States. Reference to Fig. 2 will show that, in Texas, growth in the vegetative phase is very great. The curves shown are the mean of three years' results from the Denton Centre in Stansel, Dunkle and Jones' experiments (1937). The curves level off in May as the late-defoliated plots were completely 'grazed out' by that time and failed to produce grain. The unclipped plots produced only 10·7 cwt. of grain. Unfortunately straw yields were not quoted. By assuming the yield of straw to be as much as twice that of the grain, the total dry-matter production at maturi could only have been approximately 30 cwt. p acre. Thus a greater yield of dry matter (47·0* cw per acre) occurred in the vegetative phase of grow than in the fully mature state—a fact that may l related to the grain increase resulting from grazin Similar results apply in the case of winter oa where again a grain-yield increase was obtaine Here the yield of dry matter during vegetati growth was 38·3*cwt. per acre against tota mature air-dried material of between 31·0 ar 46·5*cwt. per acre according to whether the grai straw ration is taken as 1 : 1 or 1 : 2. In contras with winter barley, where grazing gave negati responses, the vegetative-growth dry matter w 39*cwt. per acre as against an air-dried, tota mature yield of 43·4* or 65·1*cwt. according grain : straw ratio assumptions of 1 : 1 or 1 : respectively.

It is evident from the fact that several of th USA experiments are concerned with pasturi in the fall (see Table 1) that the greater growth the vegetative phase compared with that in th U.K. is a common feature there. Additional co firmation comes from Washko's work (1947) whe from 5 to 8 cwt. of air-dry fodder per acre autumn were produced from two varieties of eac of the four main cereals. In these experiments, cu were taken when forage growth in the autum had reached a height of 8–12 in. Very high yiel in the vegetative phase are reported by oth workers, notably under irrigated conditions South Africa by Turpin and Marais (1933) (s Table 5).

It is most probable that temperature is th main ecological factor responsible for the contras in vegetative growth under British and America conditions. Table 4 gives the monthly day-degre of temperature above 42°F. for stations in Tex and England.

To attain anything like the same quantity vegetative growth for the average season in th country it would be necessary to drill much earli than is customary. In the single Rothamste experiment quoted in Table 5, drilling was carri out on 23 July. A greater amount of winter growt is likely to be produced in S.W. England compare with the eastern counties.

Soil factors as well as temperature affe growth. Attention has already been drawn to th greater carrying capacity of winter wheat aft fallow as compared with the same crop after whe in the Kansas experiments (Swanson and Anderso 1951).

In comparing forage production from th cereals most observers comment on the earli grazable yield obtainable from winter oats, barle and rye compared with wheat. Confirmation

* Figures for the two years where both forage yield and grain yield were obtained.

TABLE 4

Monthly day-degrees of temperature above 42°F.

Station	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
TEXAS: DENTON (*Stansel et al.*, 1937)								
Mean of 1931–2 & 1933–4								
Actual	806	420	186	217	232	373	690	930
Cumulative from 1 Oct.	806	1226	1412	1629	1861	2233	2923	3853
YORK (*Bilham*, 1938)								
Cumulative from 1 Oct.	248	278	278	278	278	278	398	739
Cumulative from 1 Aug.	1226	1256	1256	1256	1256	1256	1376	1717
CAMBRIDGE (*Bilham*, 1938)								
Cumulative from 1 Oct.	248	278	278	278	278	278	398	739
Cumulative from 1 Aug.	1287	1317	1317	1317	1317	1317	1437	1778
PLYMOUTH (*Bilham*, 1938)								
Cumulative from 1 Oct.	314	491	584	615	643	736	916	1257
Cumulative from 1 Aug.	1410	1560	1653	1684	1712	1805	1985	2326

TABLE 5

Comparative yields of forage from the four main cereals

	S. Africa (*Turpin and Marais, 1933*)	Tenessee (*Washko, 1947*) D.M. cwt. per acre			Texas (*Stansel et al., 1937*) D.M. cwt. per acre			Rothamsted (*Report, 1932*) D.M. cwt. per acre		
Crop	G.M. cwt./acre	Autumn	Spring	Total	Angleton	Denton	Lubbock	Autumn	Spring	Total
Wheat	54·5	4·7	8·8	13·5	9·6	55·7	25·5	1·9	12·6	14·5
Rye	73·7	6·4	11·7	18·1	5·8	39·7	28·3	3·7	18·0	21·7
Barley	70·6	6·1	8·3	14·4	9·1	47·8	18·9	3·1	13·1	16·2
Oats	63·4	6·8	6·1	12·9	9·7	41·7	21·0	3·9	9·5	13·4

his is obtained from the growth curves given in ig. 2. Comparisons obtained by several workers, ncluding the results from one year from Rotham- ted, are given in Table 5.

In addition, variety comparisons have been nade by American (Hubbard and Harper, 1949), rgentinian (*Bol. chac. exp. La Previsión*, 1935–9), ustralian (Sims, 1943) and S. African (Turpin and Marais, 1933) workers. Each has found that arieties have shown differences in forage yield.

Nutritive value

The nutritive value of the forage produced as been determined by several workers using the onventional partial feeding-stuffs type of analysis. wo examples only are quoted here, one from the orkshire experiments (Holliday and Storey, 946) and the other from Texas (Stansel, Dunkle nd Jones, 1937). The composition at different ates of cutting given in Table 6 are from herbage samples taken from the first of the Yorkshire experiments given in Table 2.

TABLE 6

Change of feeding value with increasing maturity in cereal forage

Date of cut	% D.M.	% Crude protein in D.M.	% Crude fibre in D.M.
19 March ..	18·9	27·5	15·0
3 April ..	18·9	21·7	17·0
17 April ..	21·4	15·1	17·8
1 May ..	19·6	12·6	19·1

Attention is drawn to the high protein content of the forage at the time of the first cut. It must be realised, however, that the yield of dry matter

was only 1·7 cwt. per acre on that occasion. With the later cuts, yield increased to 6·1, 13·0 and 19·5 cwt. of dry matter per acre, respectively. The percentage crude-protein content was drastically reduced with the later cuts and there was an accompanying increase in crude-fibre content. The results are parallel with those obtained from grass with increasing maturity (Watson, 1939). Somewhat similar results are quoted by Smith and Robb (1943), Odland, Cox and Moran (1942) and Kirk, Davidson and Hamilton (1934).

In Texas, Stansel, Dunkle and Jones (1937) obtained chemical analyses on a very large number of cereal herbage samples taken during the winter vegetative phase of growth. The mean values of these are given in Table 7.

TABLE 7

Comparative feeding value of the vegetative growth from the four main cereals

Crop	Data	% Crude protein	% Crude fibre
Wheat	5 crops, 25 cuts	22·9	17·5
Barley	4 ,, , 21 ,,	24·8	17·1
Oats	5 ,, , 23 ,,	22·9	18·2
Rye	3 ,, , 15 ,,	28·6	15·7

Comparison with Table 6 shows that the mean composition of the wheat forage in Texas was very similar to that taken at the second cut in the Yorkshire experiment. Results giving similar high protein values when cuts are taken in the vegetative growth phase are quoted by McMillan and Langham (1942), Cariss (1945), Washko (1947), and Turpin and Marais (1933).

It may be concluded that the winter-sown cereals are capable of giving material of high nutritive value during the vegetative growth phase, but a rapid deterioration sets in with a change of the growth phase.

Other effects on stock

There are some reports of troubles occurring when stock graze cereals. For instance, bloat was reported in Kansas by Swanson and Anderson (1951). It was particularly liable to occur when the grazing followed rain or snow. Bloat has also been reported by Shanks (1946) as a hazard with sheep on winter wheat in Great Britain.

The fibre content of cereal herbage, even when grazed in the vegetative phase, is rather on the high side. There are, nevertheless, several reports of the advantages to be gained by supplying stock with some dry fodder such as hay, whilst grazing cereals. In Australia, McCymont and Paxton (1947) showed that where dairy cows were grazing oats with concentrates only, the butter-fat percentage of the milk fell from 4·3 to 2·6. Where hay was included in the ration there was no such fall. These are well-known happenings when dairy stock graze a pasture in the spring flush of growth (National Institute for Research in Dairying, 1949 and 1950).

There are also some reports of taints liable to occur in milk when cows graze cereals. For instance, Babcock (1923) reported taints from rye and stated that they could be avoided if the pasturing was allowed immediately after milking only. Other reports in the literature mention low palatability when cereals reach a certain stage of growth. It is a matter for observation in this country that in the early stages of shooting, wheat leafage in particular has a tendency to produce a rank smell. This is particularly pronounced when the leaf is a very dark green, as a result of plentiful nitrogenous fertilising. This rank smell is associated with reduced palatability.

Conclusions

Economics of the practice

It is obvious that where grazing a winter sown cereal results in an increase in subsequent grain yield, there is everything to be said for the practice. If the forage is available during the winter it would partly replace relatively expensive conserved feeding stuffs ; when available in the early spring it would either shorten the winter feeding period or supplement grazing from grass grown for "early bite", from Italian ryegrass catch crop or from late kale. It has been shown that increases in yield have been associated with two ecological conditions ; one where a prolific growth in the vegetative state is associated with a rather limited final yield of grain ; the other where the practice reduced lodging, which, in itself, would limit grain yield. Associated with each of these conditions the type of defoliation, whether by grazing or clipping, has been limited in its severity and duration.

In most of the experiments quoted, a decrease in grain yield has accompanied grazing. Further the decreases have been more pronounced with greater intensity of grazing. All the British experiments, with the exception of those in the south-west and two in Kesteven, have given yield decreases. In these circumstances, the economic problem is that of converting a proportion of the vegetative growth into meat or milk in such a way as to get a greater profit, in spite of a lowered grain yield. The problem will be affected by the relative price of the animal product on the one hand, and the sale value of the grain on the other. It will also be affected by the quantity of animal product produced in relation to the magnitude of the grain yield decrease.

There is insufficient data available from experiments in Great Britain to be able to give an answer to a problem with so many variable

TABLE 8

Summary of returns from two centres*

	Yield of dry herbage per acre	Yield of grain per acre	Gross returns. Dry herbage	Gross returns. Grain	Total gross return
	cwt.	cwt.	£	£	£
Control	—	23·0	—	19·2	19·2
Cut 19 March	0·94	17·7	0·1	15·3	15·4
,, 3 April	4·70	16·1	5·9	14·1	20·0
,, 17 ,, ...	11·36	11·9	14·2	10·9	25·1
,, 1 May	17·48	8·5	21·9	8·3	30·2

* Assuming the 1946 prices of wheat at 15s. per cwt. plus £2 per acre acreage payment and dried grass at £25 per ton.

involved. The following estimates may nevertheless have some value. If the positive responses gained in the south-west and Kesteven are ignored, the grain losses resulting from grazing in this country (see Table 2) have the following range: grazing to end March −4·5% to −44%, grazing to mid-April −3·3% to −33%; grazing to end April −3·2% to −87·0%; grazing in May −14·0% to −86%. Taking the mid-points in each range and applying them to a grain yield of 25 cwt. per acre, they amount to 6·25, 4·75, 11·5 and 12·5 cwt. loss in yield, respectively. Taking a standard price of 25s. per cwt. this amounts to losses of gross returns per acre of £8, £6·3, £14·4 and £15·6. To pay for such a loss, it would be necessary for the grazing to provide between 1 and 3 cwt. of beef per acre, or, with milk at 3s. per gal., between 42 and 104 gal. per acre.

The problem was put in a slightly different form by Holliday and Storey (1946). Here the gross value of the grain lost was set against the gross value of dried herbage produced (see Table 8).

It was considered that the extra gross returns obtained from cutting on 1 May were insufficient to pay for the extra cash expended in cutting, collecting and drying the green fodder.

The need for further investigations

There is an obvious need for further information from experimental work in Great Britain. There is a particular need for investigation into the effect of defoliation upon the grain yield of crops where conditions have been adjusted to allow for prolific vegetative growth in the autumn and winter. This will probably require crops to be sown abnormally early, and possibly also, they should receive relatively high rates of nitrogenous fertilizing at sowing time. Only two experiments with such abnormally early sowing have been reported—one at Rothamsted (Rothamsted Experiment Station, 1932) which was not taken through to grain yield, and one at Leeds (see Table 2) which suffered severe bird damage on the plots which ripened abnormally early. There is also a need for work upon the degree of intensity of defoliation in the sense of closeness of cut. The only information in this country is from one of the Wye experiments (Peto, 1952). It would seem from the data quoted in Table 2 that such investigations might be most profitably pursued in south-west England. Table 4 suggests that for the average season the temperature conditions in the south-west are likely to be such as to result in a grazable yield earlier in the spring. Grazing would therefore be more likely to be available in the truly vegetative-growth phase rather than at the change-of-growth phase.

Quite apart from the need for a greater volume of information from experiments in Great Britain, there is a need for further investigation into the reasons behind the yield increases in those areas where they are reported. They raise some interesting and fundamental questions. For example, in a cereal crop, can vegetative growth be produced in excess of that required to support the grain yield, which itself may be limited by other environmental factors? In the Texas and Kansas experiments, are good growing conditions in the fall, winter and early spring leading to the production of vegetative growth greater than is needed to support the rather low grain yield allowed by the summer drought? The evidence presented suggests that this is indeed the case and it represents an interesting ecological balance between vegetative and reproductive growth. There are of course other possible explanations for increased yields resulting from grazing in these experiments. Stansel, Dunkle and Jones (1937) were inclined to attribute the positive responses in Texas to reduced frost damage of the herbage on the defoliated plots. Quite a different explanation might be that winter grazing reduced loss of soil moisture by transpiration so allowing a greater quantity to be available for grain produc-

tion. Control of lodging is often invoked as an explanation of the occasional increases in grain yield from grazing. Whilst this was a factor in the Indiana and New Jersey experiments, as well as in one of the Kesteven experiments, it certainly was not the explanation of grain increases obtained in the other experiments summarised in Tables 1 and 2. A better understanding of these ecological relations would enable an assessment of the possibilities of the practice of grazing cereals in Great Britain.

Finally, it must be realised that damage to the soil by poaching may severely restrict the areas in this country where grazing, in anything but the drier spring months, could be practiced. Such damage would be very liable to occur if, by early sowing, and the use of fertilisers, a grazable crop could be produced in December, January an February.

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Correction

Page 133, Table 2. Under Yorks, Exp. V(g), the entry — 53%* should be placed in the previous column.

FIELD CROPS

CEREALS

WHEAT

1059 SIMON, W. Ertragsanalytische Untersuchungen an gedrillten und gedibbelten Getreideversuchen. [**An analysis of yields from drilled and dibbled wheat.**] *Bodenkultur* 1955, **8,** No. 3, 244–53, bibl. 10. [Hochsch. Bodenkultur, Wien-Gross-Enzerdorf, Austria]

Good agreement was obtained between yields of winter wheat sown by drilling in rows 12·5 cm. apart at a rate of 286 seed per m^2. and by dibbling (placing 1 and 2 seeds alternately at intervals of 3·5 cm. along a row) at the same rate. Agreement was observed not only in weight of grain per hectare but also in 1000-seed weight, weight of grain per ear and number of grains per unit area. From these experiments it is deduced that for the testing of varieties, seed sown by dibbling can be expected to give similar results to that sown by drilling on a field scale. Importance is attached to the fact that during the 3 years of the experiment, the agreements were obtained under a variety of weather conditions.—D.B.

1060 KINBACHER, E. J. **Resistance of seedlings to frost heaving injury.** *Agron. J.* 1956, **48,** No. 4, 166–70, bibl. 8. [Agron. Dep., Univ. California, Davis]

Laboratory studies were conducted on frost-heaving damage in 2 herbage grass species and on Baldrock and Minhardi winter wheat. The wheat seed was sown at depths of 1 or 2 in. in Aiken clay loam soil, placed in cardboard cartons. Frost-heaving tests were carried out when the wheat seedlings were 10 days old and 6 in. high, in the early, second-leaf stage. The plants were conditioned to cold by exposure to 38° F. for 5 hr. at 2 days before, and to 28° F. for 1·5 hr. at 1 day before the frost-heaving tests began. In the tests, the cartons were saturated in water and exposed to two 48 hr. freezing periods, interrupted by 24 hr. of thaw. After treatment the plants were allowed to recover for 1 week before examination. The extent of soil lift was about 3 times that of plant lift. Twelve Baldrock plants with broken stems were dead after the recovery period, but only 1 out of 5 plants with broken roots was dead ; the effect on Minhardi plants was similar. In both varieties, half the stem breakage occurred in the second or third internode and the rest in the leaves. All stem injury was within 16 mm. above, or below, the shoot apex and all plants with broken stems died, whether the injury was above, or below, the apex. Sowing at 1 or 2 in. depths resulted in similar incidences of injury. The wheat varieties were twice as resistant to soil heaving as the grasses, since twice as much soil lift was needed to injure them to the same extent.—P.J.B.

1061 VANDENPLAS, A. Le gel des froments d'hiver. [**Frosts and winter wheat.**] *Rev. Agric., Brux.* 1956, **9,** No. 2, 181–95.

The critical conditions for survival of winter wheat during frosts have been studied from meteorological records since 1900. These show that a snow cover to a depth of 2 in. is sufficient to prevent frost damage. However, if the snow cover is less than 2 in., 3 consecutive days of hard frost (—13°C. min.) included in a long period of frost at —5° C. to —10° C., cause the wheat crop to suffer injury from various physiological causes. The temperatures quoted are of the macroclimate. Some indication is given of the probable temperatures in the vicinity of the soil and the young plant under the above conditions.—D.B.

1062 VANDENPLAS, A. La vague de froid de février 1956 et les emblavures des froments d'hiver. [**The cold spell in February, 1956, and the winter-wheat crop.**] *Rev. Agric., Brux.* 1956, **9,** No. 3, 316–21. [Inst. Roy. Mét., Serv. Climatol., Belgium]

1956 had the coldest February since records were first made (1833) at the meteorological station at Uccle. It is, therefore, an important year for observations on frost damage to crops. At the time of writing (12.3.56) it was too early to make definite statements on this year's frost damage to the winter-wheat crop, but certain facts came to light. (1) The snow cover lay as a thin sheet of ice. In some fields this sheet did not adhere firmly to the soil, and the thin layer of air between ice and soil protected the crop. In February, 1956, soil temperatures at various depths were higher under a layer of ice than they were under bare soil in February, 1954. (2) It is possible that plants from a late sowing suffered less than those sown at the beginning of autumn because they had made less growth. (3) It required several days of continuous frost to kill plants already partially injured.—D.B.

1063† LAWS, W. D. **The limitations of overseeding winter wheat in the blacklands with Hubam sweet clover.** *Bull. 3. Hoblitzelle agric. Lab. Tex. Res. Found.* [Renner, Texas]

Winter wheat and cotton were grown in rotation for 7 years. The effects of overseeding the wheat with the annual Hubam sweet clover [*Melilotus alba*] and of chiselling the wheat soil to a depth of 12 in. were compared as measures for improving

productivity. Stands of Hubam were seldom obtained when the wheat was adequately fertilized. Both treatments failed to increase the wheat yield.—J.F.C.

1064 PENDLETON, J. W. **The effect of planting rates and nitrogen levels on winter wheat varieties with different morphological characteristics.** *Diss. Abstr.* 1956, **16,** No. 2, 203–4. [Univ. Illinois, Urbana]

The results are given of 3 years' trials in Illinois on the response of 4 winter-wheat varieties with different morphological characteristics, to different rates of sowing and different levels of N supply. Highest grain yields followed the use of a 6-peck sowing rate per ac. There were highly significant differences between varieties in their response to sowing rates. The date of differentiation of the apical meristems constituted a reliable index of the earliness of given varieties. Each variety headed at about 48 days after the spike began to differentiate.—P.J.B.

1065 LAROSE, E. and others. Classification et identification des races de froment et épeautre cultivées en Belgique. [**Classification and identification of the varieties of wheat and spelt cultivated in Belgium.**] *Bull. Inst. agron., Gembl.* 1944 [1956], **13,** No. 1–4, 7–113, bibl. 3, illus. [Sta. Rech. Amélior. Pl. de Grande Culture, Gembloux, Belgium]

The classification of wheat varieties cultivated in Belgium, which has been worked out over many years, is based primarily on the characteristics of the ear, grain and straw. A key is given and it is followed by a detailed description, with a photograph, of each of about 30 varieties. (Since this work was begun some of these varieties have been removed from the Official List.) These commercial varieties fall into three botanical varieties—*Triticum vulgare ligulatum muticum* vars. *albidum, lutescens,* and *milturum.* Of spelt wheat, only 2 varieties are cultivated in Belgium.—D.B.

1066 NOULARD, L. Description des variétés de froment cultivées en Belgique. [**Description of wheat varieties cultivated in Belgium.**] *Bull. Inst. agron., Gembl.* 1944 [1956], **13,** No. 1–4, 115–38, bibl. 6, illus. [Sta. Rech. Amélior. Pl. de Grande Culture, Gembloux, Belgium]

A full description, with photographs, is given of each of the following recent additions to the Belgian Official List of varieties: Alfy, Bellevue, Blé d'Avril, Cappelle-Desprez, Heines VII, Jufy I, Jufy II, Leda, Panter, Phoebus, and Rustique.—D.B.

1067 PETINOV, N. S. and HARANJAN, N. N. [**Anatomic and physiologic peculiarities of branched wheat under irrigation.**] [Russian] *Fiziol. Rast. (Pl. Physiol. USSR)* 1956, **3** No. 1, 12–22, bibl. 32. [Timirjazev Inst Pl. Physiol., Acad. Sci. USSR, Moscow]

This study was made with the wheat varieties Kahetinskaja (branched) and Melanopus 69 (common type). The branched type has a distinct mesomorphous structure and is more responsive than Melanopus 69 to watering and fertilizers, but under drought conditions of the Volga region branched wheat does not make full use of its potential possibilities (expressed by the large assimilating leaf-surface area and highly developed vascular system). The comparatively low productivity of branched wheat is attributed to the weak flow of plastic substances from the vegetative organs to the wheat ear and to the plant's low resistance to high temperatures which is responsible for the relatively high numbers of sterile flowers.—From authors' English summary

1068 BHARDWAJ, S. N. and RAO, I. M. **Studies on the effect of sulpha-drugs on germination growth and maturity of wheat.** *J. Res., Agra* 1955, **4,** Pt. 2, 387–95, bibl. 12, illus. [Bot Dep., Agra Coll., Agra., India]

Seed of the wheat variety C.591 was partly immersed in solutions containing 10, 100, 1000 and 5000 ppm. concentrations of Cibazol (2-(p-aminobenzene sulphonamido)-thiazole, sulphaguanidine and Irgafen (N_1-3, 4-dimethylbenzyl-sulphanilamide), and in water, for 24 hr. at 20–22°C. After soaking, the seeds were sown in soil in pots. Sprouting of seed was stimulated by the lowest concentration of each chemical, but was decreased by higher concentrations, except Irgafen in concentrations of 100 ppm. Only Irgafen at 10 ppm concentrations resulted in significant germination increases over controls (dry seed), but not compared with seed that had been pre-soaked in water. Except where 10 ppm. concentrations were used, early plant growth was retarded by all 3 chemicals. This effect diminished progressively, until plant heights at maturity equalled, or excelled those of the controls. Plant growth stimulation as judged at maturity was particularly marked where 10 ppm. of Cibazol were used. The initial adverse effects of Irgafen on growth tended to persist up to the stage of maturity. Grain yields were increased by treatment with 10 ppm. of Cibazol or sulphaguanidine. The similarity of growth regulating effect between the sulpha drugs used and 2,4-D or NAA is noted.—P.J.B.

1069 BHARDWAJ, S. N. and RAO, I. M. **Influence of time of sowing on the effect of 2,4-D on growth and maturity of wheat.** *Physiol. Plant.* 1956, **9,** No. 2, 257–64, bibl. 9 illus. [Dep. Bot., Agra Coll., Agra, India]

A review of the literature on the effects of 2,4-D on

crop plants is given. Seed of the wheat variety C.591 was presoaked in solutions of 2,4-D at 0, 10 and 100 ppm. for 24 hr. and sown in pots with control (dry seed) in the first week of November and of December. Observations on the following were recorded : sprouting during soaking, germination in the pots, shoot dry-weight at 4 weeks ; height of main shoot, and number of leaves and tillers at 4-week intervals up to maturity ; date of ear emergence, final shoot dry-weight, grain yield and 1000-grain weight. Results (except those on sprouting percentage) were statistically analysed. Sprouting was adversely affected by 2,4-D, especially at the 100 ppm. level, which alone inhibited germination in both sowings. An initial depressant effect on height was noted for treated seed in both sowings (especially November). The effect on height varied with concentration and time of sowing, but by maturity there were no significant differences in height due to treatments in both sowings. In the November sowing, the yield of dry matter in the shoots was significantly lower at 100 ppm. than in the control. In the December sowing, 10 ppm. gave the highest yield, the yield from 100 ppm. being equal to that of the control. Grain yield in the November sowing was scarcely affected by 2,4-D at either level, but in the December sowing, 10 ppm. gave a 33% increase over the control, the yield from 10 ppm. being almost equal to that from the control. In both sowings, the 1000-grain weight was better from 10 ppm. From 100 ppm., quality was equal to that in the control.—J.F.C.

1070 BURROWS, V. D. and OLSON, P. J. **Reaction of small grains to various densities of wild mustard and the results obtained after their removal with 2,4-D, or by hand. 1. Experiments with wheat.** *Canad. J. agric. Sci.* 1955, **35,** No. 1, 68–75, bibl. 8. [Univ. Manitoba, Winnipeg]

Spring wheat (*Triticum aestivum*), sown at 2 bu./ac. in 1952, and at 1, 2 and 3 bu./ac. in 1953, was grown alone or in association with various densities of wild mustard (*Brassica arvensis*). When the wheat was in the 5-leaf stage in 1952, and the early 4-leaf stage in 1953, some of the plots were sprayed with 2,4-D butyl ester at 6 oz. and 4 oz. a.e./ac., respectively. It was found that the presence of wild mustard affected adversely the growth, tillering and yield of wheat. Tillering and yield were reduced in both the sprayed and the unsprayed plots in 1952, but only in the unsprayed plots in 1953. This was believed to be due to removal of the weed at an earlier stage of growth in the latter year. In general, while increasing the seed rate of wheat increased the grain yield in weedy plots, the yield was not increased where weeds were removed by 2,4-D or by hand.—From authors' abstract.

1071 RASMUSSEN, L. W. **Evaluation of selective weed control in wheat.** *Weeds* 1956, **4,** No. 1, 15–21, bibl. 3. [Dep. Agron., State Coll. Washington]

In evaluating weeds, it is necessary to include some measure of competition potential. This entails degree of injury, subjectively assessed on a rating scale, coverage (after Braun-Blanquet), and height. Number of weeds is regarded as a less suitable measure than coverage. Wheat yield is considered a criterion of weed-control and of herbicidal effects on wheat. Designs of experiment and the difficulty of obtaining increased precision are discussed. A balanced incomplete block design is regarded as suitable where a large number (9–25) of treatments is needed. Plots of 6 × 29 ft., or broader, are recommended.—J.F.C.

1072 BATTS, C. C. V. and FIDDIAN, W. E. H. **Effect of previous cropping on eyespot in four varieties of winter wheat.** *Pl. Path.* 1955, **4,** No. 1, 25–8, bibl. 5. [N.I.A.B., Cambridge]

Four 1-acre plots were established on an area which bore a crop of wheat that had suffered heavily from eyespot (*Cercosporella herpotrichoides*) in 1950. In 1951 and '52, the following crops were sown : spring barley for 2 years on plot 1, spring barley, then fodder-beet on plot 2, sugar-beet, then spring oats on plot 3 and S.100 white clover for 2 years on plot 4. In the autumn of 1952, each plot was divided into five and sown with the winter wheat Cappelle Desprez, Hybrid 46 and Juliana at rates of 2·5 bu. per ac. and Bersée at rates of 2·5 and 1·5 bu. per ac. On plot 1, after two barley crops, over 80% of the stems of all varieties were infected with eyespot. One year's roots in plot 2 had no appreciable effect on eyespot infection. Two years' root crops on plot 3 reduced the mean percentage of infected stems to about 40, while two years' clover on plot 4 reduced eyespot incidence to a mean of 16%. Bersée, sown at the lower rate, had an appreciably lower number of stems infected with eyespot than where the higher sowing rate was used and produced slightly higher grain yields. There were few differences between varieties in respect of numbers of stems showing any degree of eyespot infection, but considerable differences between varieties in terms of the number of stems showing severe eyespot infection. Cappelle Desprez suffered about one-third as much severe infection as the other varieties. Juliana was the most severely infected variety.—P.J.B.

1073 GLYNNE, Mary D. and others. **Fungal diseases of cereals.** *Rep. Rothamst. exp. Sta. 1955* Harpenden, 1956, 103–5.

In the ley/arable experiment, infection of wheat straws with eyespot (*Cercosporella herpotrichoides*) after arable, cut grass, grazed ley and lucerne was

43, 5, 1 and 7%, respectively, on Highfield, and 72, 7, 6 and 16%, respectively, on Fosters. Lodging in Proctor barley tended to increase with increasing seed rate (1, 2, 3 bu. per ac.) and increasing N (1·5, 3, 4·5 cwt. ammonium sulphate per ac.). Yield was not affected by seed rate. The wheats Cappelle and Holdfast averaged 20·5 and 14 cwt. per ac., respectively, when grown after wheat, and yielded 51–60 and 41–44 cwt. per ac., respectively, when grown after potatoes and receiving 3 and 6 cwt. nitrochalk per ac. The yield differences were associated with a higher incidence of eyespot, take-all (*Ophiobolus graminis*) and weeds in the crop following wheat. Cappelle was slightly more resistant to eyespot but more susceptible to take-all than Holdfast. Nitro-chalk applied in April decreased the percentage infection of take-all more than when applied in March or May. Eyespot incidence was greatly increased by N, especially where applied in March.—M.P.

1074† Wehrle, V. M. and Ogilvie, L. **Effect of ley grasses on the carry-over of take-all.** *Pl. Path.* 1955, **4,** No. 4, 111-13, bibl. 2. [N.A.A.S., Bristol]

In trials in Dorset, plots of timothy [*Phleum pratense*], meadow fescue [*Festuca pratensis*], perennial ryegrass [*Lolium perenne*] and cocksfoot [*Dactylis glomerata*], each in mixtures with white clover [*Trifolium repens*], were established on an area which had previously been heavily cropped with cereals and on which winter wheat had suffered severely from take-all [*Ophiobolus graminis*] during the 1948/9 season. The site was sown to wheat during the 1949/50 season and the herbage species established in the spring of 1950. When sampled on 1 Jan., 1950, about 39% of the wheat roots were infected with take-all. In tests on 1 Nov., 1950, the mean percentages of grass roots infected with take-all were 55 for timothy, 75 for ryegrass, 31 for meadow fescue and 62 for cocksfoot. The herbage plots were each divided into 3 and winter wheat sown in the autumns of 1951, '52 and '53. The mean percentages of infected wheat roots at harvest after a 1-year ley were 3·8, 3·8, 4·5 and 1·4 following cocksfoot, meadow fescue, ryegrass and timothy ; after a 3-year ley percentages were 0·8, 1·3, 2·4 and 2·6, respectively. These results showed that the amount of take-all inoculum declined to relatively low levels after a 1-year ley, irrespective of the herbage species used. The incidence of take-all in wheat was serious after only one wheat crop following a 1-year ley.—P.J.B.

1075 Pfadt, R. E. **Control of pale western cutworm in wheat.** *J. econ. Ent.* 1956, **49,** No. 2, 145–7, bibl. 3. [Wyoming Agric. Exp. Sta., Laramie]

Endrin applied at rates of 0·2, 0·3 or 0·4 lb. of actual toxicant per ac. by a ground rig deliverin 15 gal. of spray per ac. gave complete control of th pale western cutworm (*Agrotis orthogonia*) infestin winter wheat. Endrin applied at the rate of 0·2 0·3 lb. per ac. by aeroplane delivering 1 ga emulsion per ac. also gave complete control.—E.B.

1076 Hänsel, H. Entwicklungs-Relatione verschiedener Organe von Winterweize (*Triticum aestivum* L.). [**Developmental re lationships among the different organs winter wheat.**] *Z. PflZücht.* 1955, **35,** No. 2 117–36, bibl. 22, illus. [Probstdorfer Saa zucht Stat., Lower Austria]

The post-winter development of winter wheat wa studied with special attention to the influence spacing and nutrients on the number of each yield determining organ (on each plant). The metho adopted was similar to that in *Fld Crop Abstr* 9 : 698. Increasing the space surrounding eac plant from 30 cm.^{2} to 125 cm.^{2} resulted in a genera increase in the number, size and dry weight organs of one kind, with the exception of th number of crown roots per ear-bearing shoot an the number of flower stalks per fertile spike ; thes remained the same for both spacings. In the wide spacing, growth of stalks and ears was at firs delayed, but continued longer and overtook th growth of these organs on plants grown close together. The date at which the maximum numbe of tillers was attained was a month earlier in th narrow (1 April) than in the wide spacing (2 May) This was the most marked shifting of the date o the maximum number of any one organ induce by a difference in spacing. Supplementary fertilize (60 kg. N and 12 kg. P_2O_5 per ha.) was applied o 30 March, 18 April and 12 May. The earlier it wa applied the taller grew the crop. On the othe hand, the later it was applied the longer becam the ear. The number of spikelets increased only when the additional fertilizer was applied on 3 March, and the reduction in the number of steril basal spikelets was greatest with the later applica tions. From the results (tabulated) it is possibl to predict the effect on yield-determining organ of the application of nutrients at a given date.—D.B

1077 Fedorov, A. K. [**Some characteristics of the light stage of winter plants in relation t their winterhardiness.**] [Russian] *Doklady Akad. Nauk SSSR* (*Proc. Acad. Sci. USSR*) 1956, **107,** No. 4, 605–8, bibl. 4. [Inst Genet., Acad. Sci. USSR]

[See also *Fld Crop Abstr.* 8 : 310, 385 and 416.] The author's work on the biology of development i winter grasses has been in progress since 1950. The present study is concerned with the effect of sowing date on plant development (for which the times o earing and apices differentiation are taken as criteria) in winter-, spring- and interchangeable

vheats. The sowings were made with both vernalzed and unvernalized seed. The winter wheats Moskovskaja 02453 and Lutescens 0329, and the spring wheat Moskovka (vernalized 70–80 days) were sown on dates between 30 April and 30 Sept. There is evidence that autumn sowing of winter- and interchangeable-plants (in contrast to spring plants) retards the passing of the light stage. On 28 Dec. soil monoliths with seedlings were taken from the field (from a sowing on 27 Oct.) of the winter Lutescens 0329 and Kooperatorka, the interchangeable type Noe (20350 of the All-Union Inst. Plant Industry) and the spring wheat Moskovka. The seedlings were placed in vessels. In the winter wheats sown on 27 Oct., the vernalization phase was already completed. On 4 Jan. the vessels were placed under different conditions of light and temperature, as follows: (1) uninterrupted light of radiation intensity 18,000 erg/cm.²/sec. at +16° to +20°C.; (2) 15-hr. day with radiation intensity 5500 erg/cm.²/sec. at +8° to +10°C. (autumn conditions). The data show that under (1) rate of development in spring-, winter- and interchangeable-plants was practically the same (the period from germination to apices differentiation being 8 days for Moskovka and 12 days for Noe and Lutescens 0329). In (2) the interchangeable- and winter-wheats showed considerable retardation in development compared with the spring wheat Moskovka, (the period from germination to apices differentiation being 30 days for Moskovka, 65 days for Noe and 72 for Lutescens 0329). These results confirm that, compared with spring wheat, the passing of the light stage is retarded in interchangeable- and winter-wheats under autumn conditions and there is evidence that this retardation is greater, the more winter-resistant the varieties are.—M.H.

1078 BAUMANN, H. and KLAUSS, M.-L. Gefässversuche mit Sommergetreide zur Frage der konstitutionellen Anpassung der Pflanzen an die Wasserversorgung. [**Pot experiments with spring cereals to study the constitutional adaptability of plants to their water supply.**] *Z. Acker- u. Pflbau* 1956, **101,** No. 1/2, 35–52, bibl. 22, illus. [Inst. Acker- und Pflanzenbau, Humboldt- Univ., Berlin]

Wheat and barley plants brought up on small quantities of water (30% of soil-water capacity) during their very early stages, i.e. up to 3rd leaf stage, and later given a normal water supply (60%), had different physiological constitutions from those brought up on a normal water supply throughout their lives. In the former, thicker leaves developed, the weight of straw was lower, the transpiration rate from heading to ripening increased and, in moderately watered plants, the generative phase set in earlier and lasted longer but this did not always result in higher yields. Heavy watering in the early growth stages caused an extension of the vegetative phase and a shortening of the reproductive phase. In the vegetative phase water absorption increased with water supply, but in the reproductive phase water absorption was clearly unrelated to water supply. Similar yields can be obtained from quite different water supplies.—D.B.

1079 DADYKIN, V. P. [**The formation of amino-acids in wheat roots under conditions of isolated nutrition and low temperature in the root zone.**] [Russian] *Doklady Akad. Nauk SSSR* (*Proc. Acad. Sci. USSR*) 1956, **106,** No. 5, 923–5, bibl. 7, illus.

It is recognized that plant roots not only absorb nutrients but they are also organs in which complex organic substances, necessary for the normal growth and development of the plant, are synthesized. It has been demonstrated [e.g., Kursanov in *Physiol. Rast.* 1954, 1, No. 1 and Kolosov in *ibid.* 3, No. 1] that amino-acids are formed in roots. In the present work, experiments made with the spring wheat variety Jakutjanka are reported. The aim was to trace the formation of amino-acids in the roots of this plant using a modification of the method recorded by the author in *Doklady Vsesojuz. Akad. S-H Nauk* 1950, No. 7, and analysis by paper chromatography. There is evidence that low temperature (approx. 6°C.) of the nutrient solution interrupts the synthesizing activity of the roots and this results in an acute decline in the number of amino-acids present. This decline, in turn, retards plant growth in cold soils.—M.H.

1080 ELIASSON, L. and MATHIESON, I. **The effect of 2,4-dinitrophenol and some oxidase inhibitors on the oxygen uptake in different parts of wheat roots.** *Physiol. Plant.* 1956, **9,** No. 2, 265–79, bibl. 42, illus. [Bot. Lab., Lund, Sweden]

Roots of Eroica wheat seedlings were grown, sterile, in a nutrient solution containing glucose. The lengths of the root segments used, in order from the tip, were: 2 mm. (mainly meristematic), 3 mm. (main extension zone), 5 mm. (last part of extension zone and beginning of differentiating zone) and then 10 mm. sections. They were suspended in Warburg flasks. The effect of 2,4-dinitrophenol (DNP), sodium azide, potassium cyanide and diethyl dithio carbamate on the oxygen uptake of the segments was studied. A greater sensitivity to the inhibitory action of DNP was shown by the younger parts of the root. Its stimulatory and inhibitory effect was interpreted as due to its action on the concentration of adenosine triphosphate. The sensitivity of roots to sodium azide and potassium cyanide decreased

with the distance from the root-tip. Diethyl dithio carbamate caused maximum inhibition at 5–10 mm. from the tip.—J.F.C.

1081 Beesley, D. W. and Bullen, E. R. **Nitrogenous manuring of wheat.** *Exp. Husb.* 1956, No. 1, 18–24, bibl. 7.

Details are given of 41 experiments carried out from 1948–54 in the West Midland and Eastern Provinces of the National Agricultural Advisory Service. "The winter-wheat trials gave fairly consistent yield responses to N at up to 0·4 to 0·6 cwt./acre. Responses to higher levels were inconsistent and manuring above that level was not generally economic. It was, nevertheless, sometimes worthwhile. On occasion, there appeared to be some advantage in the application of heavy dressings of N in 3, as opposed to 2, instalments. The spring-wheat trials showed that the average response of spring wheat to N was similar to, but slightly lower than, the response of winter wheat. There were indications that applying all the N to the seedbed for spring wheat was inferior to dividing the application between seedbed and top dressing, especially if the top-dressed portion was put on as late as possible. Responses to N were consistently lower both with winter- and spring-wheats in the west than in the east. This may be a reflection of the preponderance of trials on light land in the east."—From authors' summary.

1082 Pastore, R. La concimazione azotata indiretta del grano in clima caldo-arido. [**The indirect N-manuring of wheat in a hot-arid climate.**] *Ital. agric.* 1955, **92,** No. 11, 793–6, bibl. 2. [Puglia, South Italy]

N applied to a legume at sowing at the rate of 20 kg./ha. increased the yields of the legume and of the wheat which followed, yields of wheat being higher, on average, than when N was applied to it direct. The legume used was either a seed legume (broad bean, little horse-bean [*Vicia faba* var. *minor*] or lentil) or a fodder legume (vetch or crimson clover [*Trifolium incarnatum*]).—E.B.O.

1083 Sinha, K. S. and Singh, M. P. **"Akand" is a good green manure.** *Indian Fmg* 1956, **5,** No. 12, 9, illus. [Bot. Sect., Sabour, Bihar]

Akand or madar (*Calotropis procera*) was found to be a good green-manure crop for wheat. The seed was sown in the last week of May or in June after the first rains and ploughed under in 3–4 months, at a height of 2 ft.—P.M.G.

1084 Commonwealth Scientific and Industrial Research Organization. **Wheat storage. Research on pest control.** *Leafl. 11. CSIRO* 1955, pp. 17, bibl. 24, illus. [ceived April, 1956]

Aspects considered include : the methods of wh storage at present in use in Australia ; the c ditions under which infestation occurs in bu stored wheat ; the biology of the insects concer and the measures for the control and prevention damage by pests. A method of wheat storage, n to Australia, which shows promise is the use of a tight silos. Wheat stored by this method is latively free from pests so that insect cont measures are unnecessary. Studies have sho that insects in air-tight silos are killed by oxyg depletion and not by CO_2 accumulation ; loss such silos has been estimated to be only 5 oz. ton of grain from the time the silo is sealed u the oxygen is depleted.—M.P.

1085 Daniels, N. E. **Damage and reproduct by the flour beetles, *Tribolium confus* and *T. castaneum*, in wheat at th moisture contents.** *J. econ. Ent.* 1956, No. 2, 244–7, bibl. 7, illus. [Kansas Ag Exp. Sta.]

A 6-months' study was made to determine amount of feeding damage caused by *Triboli confusum* and *T. castaneum* to wheat (wh kernels), of 10·2, 12·2 and 14·2% moisture conte stored at 80°F. It was found that the beet caused the most damage to the wheat of the high moisture content and that *T. confusum* cau more damage than *T. castaneum*. No live beet were present after 120 days in the wheat of 10·2 moisture content.—E.B.O.

1086 Bridges, R. G. **The fate of labelled ins ticide residues in food products. 5. T nature and significance of ethylene bromide residues in fumigated wheat.** *J. S Fd Agric.* 1956, **7,** No. 5, 305–13, bibl. illus. [Pest Infest. Lab., Slough, Bucks]

The toxic hazard from the use of ethylene bromide as an insecticide in wheat may be mi mized by efficient airing both before and af milling.—M.P.

1087 Rogner, W. Lässt sich die Anbauwürd keit von Sorten durch einen zusamm fassenden Zahlenwert ausdrücken? [**C the cultivation value of varieties be expres numerically by a comprehensive figure** *Saatgutwirtschaft* 1956, **8,** No. 6, 167–70

With the aid of examples, a system is demonstra which evaluates all characteristics of a crop express its cultivation value numerically. spring wheat, the characteristics evaluated yield, resistance to lodging, baking quali resistance to leaf diseases, time of maturity, gr attachment, and robustness of growth.—D.B.

OATS

1088† DAVIES, G. M. **The effect of winter and spring defoliation on the subsequent yield of grain and straw of S147 oats.** *J. agric. Sci.* 1956, **47,** Pt. 3, 363–6, bibl. 3. [Univ. Coll. Wales, Bangor]

The investigation, which incorporated an application of N, was carried out during 3 seasons from 1950–3. Forage available in the spring was considerably greater than that available in the winter, but it had a lower crude-protein content. Compared with the undefoliated oats, both spring and winter defoliation significantly reduced the number of productive tillers, the grain yields (particularly after winter defoliation), and the straw yields. N had no effect on tiller numbers under any treatments, but significantly increased the grain yields of undefoliated and spring-defoliated oats, and significantly increased the straw yields under all treatments.—From author's summary.

1089 SCOTTISH AGRICULTURE. **Oat variety trials 1935-53.** *Scot. Agric.* 1955–6, **35,** No. 3, 136–7.

A co-ordinated series of field trials was organized throughout Scotland by the 3 agricultural colleges. Nine oat varieties are compared, in a table, with well-known varieties as regards grain yield, yield, length and strength of straw, and maturity. As a result, Ayr Commando, Ayr Line Potato, Forward and Blenda have been admitted to the Seed Oats Certification Scheme.—J.F.C.

1090 LACROIX, L. Classification et identification des races d'avoines cultivées en Belgique. [**Classification and identification of oat varieties cultivated in Belgium.**] *Bull. Inst. agron., Gembl.* 1944 [1956], **13,** No. 1–4, 207–302, bibl. 9, illus. [Sta. Rech. Amélior. Pl. de Grande Culture, Gembloux, Belgium (now at Sta. de Phytotechnie, Gembloux)]

Oat varieties are distinguished by minute characters of the leaf, stem, panicle and grain. These are described and illustrated, and the extent to which they apply to Belgian varieties is tabulated. The key, given, is based primarily on characters of the grain. There is a detailed description, with full-page photograph, of nearly 30 varieties cultivated in Belgium.—D.B.

1091 ELLIOT, J. G. **MCPA for the control of weeds in spring oats.** *Agriculture, Lond.* 1956, **62,** No. 12, 574–7, bibl. 2. [A.R.C. Unit of Exp. Agron., Oxford Univ.]

MCPA applied as the Na or K salt at 2 lb./ac. was found to have little effect on spring oats during the period between expansion of the first leaf and the initiation of shooting. Annual weeds were controlled better in the young seedling stage than when 3 or 4 weeks older. MCPA at 1·5 lb./ac. applied early gave satisfactory control of speedwell (*Veronica* spp.), spurrey (*Spergula arvensis*), fat hen (*Chenopodium album*) and heart's-ease (*Viola tricolor*), and fairly successful control of knotgrass (*Polygonum aviculare*), red shank (*P. persicaria*), and chickweed (*Stellaria media*). During 1954, successful weed control at either time of application did not increase yields, but in 1955, earlier control of weeds resulted in greater yields. It was considered that the correct time to spray must be judged according to density and age of the weed population. In the event of infestation with a perennial weed such as creeping thistle (*Cirsium arvense*) spraying may need to be delayed until after its shoots have emerged.—J.F.C.

1092 LABANAUSKAS, C. K. and DUNGAN, G. H. **Inter-relationship of tillers and main stem in oats.** *Agron. J.* 1956, **48,** No. 6, 265–8, bibl. 7. [Agron. Dep. Illinois Agric. Exp. Sta., Urbana, Ill.]

Field trials were carried out to determine the extent of inter-stem translocation of foodstuffs after anthesis. Ten various combinations of tiller removal and the defoliation and defloration of both main stem and tillers were used, and the results were based on the average yield of ten individuals for each treatment. In undisturbed plants the main stem yielded more than individual tillers, which showed a decline in yield from the first-formed to the last, but the total for 5 tillers was higher than for the main stem. Where tillers were defoliated and deflorated, the yield of the main stem was only reduced from 2·7g. to 2·5g. The yield on undisturbed tillers was 33–58% higher than after defoliation, and, similarly, undisturbed main stems produced 21–58% more than defoliated stems. Where tiller yield was reduced, e.g. by defoliation, the amount of reduction increased from the first-formed to the last-formed. The results show that translocation occurs under certain conditions, and that in the case of natural injury, e.g. defloration of tillers, the loss is not as great as might be expected from the number of affected tillers.—G.M.W.

1093 AMIRSHAHI, M. C. and PATTERSON, F. L. **Development of a standard artificial freezing technique for evaluating cold resistance of oats.** *Agron. J.* 1956, **48,** No. 4, 181–4, bibl. 13. [Agron. Dep., Purdue Univ., Lafayette, Indiana]

The studies reported were carried out, (a) to develop techniques for rating oats for cold-hardiness in the greenhouse and cold room, so as to give ratings of the same order as those found in uniform trials in the field, and (b) to determine the relative importance of different factors influencing the survival of oat plants in artificial

tests of cold-hardiness. Six winter-hardy, and two medium winter-hardy and two spring oat varieties were used. Factors influencing survival which were studied included : combinations of temperature and duration of cold treatment, cold-hardening treatments, rate of thawing, age of plants, soil moisture and soil fertility. Differentiation of cold-resistance between varieties was obtained over the temperature range 15–22°F. Treatment at 18°F. for 12 hr. gave the best differentiation between the 3 groups of varieties used and gave results similar to those found in field trials. There was a tendency for the cold-hardiness of seedlings ranging from 9 to 45 days old to decrease up to the first 18 days and thereafter to increase. A seedling age of 31 days appeared to be satisfactory for differentiating between the 3 groups of varieties. Hardening treatments did not appear to be important for differentiating between varieties ; treatment at 34°F. for 24 hr. was selected as the optimum in terms of satisfactory survival. Four soil moisture treatments, corresponding to very dry, moist, wet and very wet were used. Only in the wet and very wet soil conditions were there varietal differences which could be related to results in the field. Soil moisture conditions had a greater effect on survival than any other factor studied and was the most difficult factor to control. Different N, P and K treatments made to the soil had no significant effect on survival. From these results, the following procedure for standard tests in greenhouses and cold rooms was selected : (a) low-fertility soil, (b) seedlings 31 days old, (c) very high soil moisture contents for both cold-hardening and cold treatment, (d) cold-hardening at 34°F. for 24 hr., (e) cold treatment at 18°F. for 12 hr., (f) gradual thawing at 36°F. for 12 hr.—P.J.B.

1094 Brown, C. M. and Shands, H. L. **Factors influencing seed set of oat crosses.** *Agron.J.* 1956, **48,** No. 4, 173–7, bibl. 8. [Agron. Dep., Univ. Wisconsin, Madison]

1095 Nelson, L. G. and others. **Copper requirements and deficiency symptoms of a number of field and vegetable crops.** *Soil Sci.* 1956, **20,** No. 1, 69–72, bibl. 5. [Dep. Soils, Univ. Wisconsin, Madison]

The need for Cu by oats on a number of upland soils was determined. Significant increases in yields of straw were obtained in several cases. In the tests on the peat soil, oats showed the greatest need for Cu among field crops. Oat yields without Cu were slightly over 1 bu. per acre, and with copper 64 bu. Copper contents of plants varied considerably, and in general, increased with copper fertilization.—J.F.C.

1096 Boken, Else. **On the effect of ferrous sulphate on the available manganese in the soil and the uptake of manganese by the pla 2.** *Plant and Soil* 1956, **7,** No. 3, 237–5 bibl. 14, illus. [Dep. Soil Fertil. and Nutr., Roy. Vet. Agric. Coll., Copenhage

Pot experiments with oats in soils deficient in M but not in Fe, showed a steady increase in yie and in Mn uptake with increasing $FeSO_4$ at vario $MnSO_4$ levels. It followed that the effect of app ing $FeSO_4$ was due to the release of Mn. Treatme of soils with hydroquinone yielded the sa amounts of exchangeable Mn as did $FeSO_4$; t suggested that the latter reduced higher oxides to Mn^{++}. Using ferric citrate, it was sho that there were no residual effects from $FeSO_4$ yield or Mn uptake. Applications of $FeSO_4$ co be used to relieve Mn deficiency for a while.—J.F

1097† MacGregor, J. M. and Mulvehill, J. **The effect of trace elements on alfalfa a oats in Minnesota.** *Bull. 213. Minnes agric. Exp. Sta.* 1955, pp. 13, bibl. 27.

Applications of B as borax and of Cu, Mn and Zn sulphates had no effect on the yield of lucerne a oats on various Minnesota soils. Heavy bor applications significantly increased the B conte of both crops in the year of application, but h little residual effect in the following year.—J.F.C.

RYE

1098 Niemann, E. Möglichkeiten zur Abtre nung von Mutterkorn aus Roggensaatg [**The possibility of separating ergot from r grain.**] *Angew. Bot.* 1956, **30,** No. 3, 65–7 bibl. 2, illus. [Biol. Bundesanst. für Lan und Forstwirtschaft, Kiel-Kitzberg, Germany]

Samples of rye containing ergot sclerotia of t same shape and size as the rye grain could not cleaned by the ordinary seed-cleaning machi but since the sclerotia had a lower specific gravi than the rye grain the seed could be cleaned taking advantage of this. The horizontal blow reduced contamination by only one half and the was a loss of 15% of rye grain. Immersing t sample of grain in a sodium nitrate solution (sp. 1·12) followed by skimming off the ergot sclero was more successful. In two samples of r contamination was reduced by this method fr 136 to 10 and from 64 to 1·7 per kg. of rye ; t loss of rye being 1·5%. This latter method requi subsequent drying of the seed in warm air.—D.B.

1099 Gott, M. B. and others. **Studies in vernali tion of cereals. 13. Photoperiodic control stages in flowering between initiation a ear formation in vernalised and unvernalis Petkus winter rye.** *Ann. Bot., Lond.* 19 **19,** No. 73, 87–126, bibl. 30, illus. [R

Inst. Pl. Physiol., Imp. Coll. Sci. Technol., London]

The photoperiodic reactions of spring rye and vernalized and unvernalized winter rye have been studied in detail and interpreted in terms of a schema presented in earlier papers. Vernalization treatments ranging from 0 to 13 weeks were used and 3 daylengths (continuous light, C.L. ; normal days, L.D. ; 10-hr. days, S.D.), and the interaction effects of these factors were studied on the following developmental features : time to initiation of flowering and to ' double-ridge ' formation ; progress of differentiation and growth rate of the apex of the main shoot before and after initiation. Systematic dissections of the apex were carried out to obtain data for this study. The validity of the concept of ' minimal leaf number ' was re-examined and confirmed by using dwarf embryos with subnormal numbers of primordia at germination. Unvernalized winter rye was shown to behave as a short-day plant before flower initiation since photoperiodic induction by short days is annulled by interrupting the dark period by a short light period at low intensity. The effect of exposure of a single leaf to continuous light, while the remainder of the plant was kept in short days, has been shown to be transmitted to the apex and hastens both flower induction and spikelet development in fully vernalized rye. Vernalized winter rye and spring rye thus behave as long-day plants.—Authors' abstract.

BARLEY

1100 Eliasson, S. and Jacobson, G. Bärgningsförsök med höstråg åren 1945-1949. Strålängdens och liggsädens inverkam på arbetsåtgången vid skörden. **Harvesting trials during the years 1945-9. The influence of length of straw and lodged or laid straw on the amount of labour required in harvesting.** *Medd. Stat. Jordbr. Försök* 1954, No. 47, pp. 20, bibl. 10, Swedish, English summary.

Three varieties of autumn-sown rye were compared. These are commonly grown in southern and central Sweden and have approximately the same maturity period, but differ in length and strength of straw. They were Petkus (Weibull's), Kungs II (Svalöf), and Agro (Holmburg). A self-binder was used in harvesting. Detailed tabulated information on the observations made show varietal differences to be fairly evident. The highest binder driving-speed and the shortest harvesting-time were associated with Kungs II, which had the shortest straw and showed the least lodging, whereas the lowest driving-speed and the longest harvesting-time were associated with Petkus, in which the straw was longest and the lodging greatest. Agro took a middle position in these respects. Greater length of straw was found also to lengthen the time required for stooking.—G.M.R.

1101 European Brewery Convention. **Report of the Barley Committee. Trials 1954.** Rotterdam, 1956, pp. 84, illus.

The trials were carried out as in the previous year [see *Fld Crop Abstr.* 9 : 56]. The varieties sown in all the trials were Kenia (standard), Busser, Carlsberg II, Herta and Proctor, with Bonus, Haisa II and Piroline in most countries. Adverse weather conditions during 1954 affected the results; the trials in Finland, Netherlands and Sweden were a failure and the overall differences between the varieties did not reach significance. With the exception of Busser and Piroline, all varieties outyielded Kenia. Herta was top-yielder and lodged least, but was not a satisfactory malting barley ; trials with it will be discontinued. Proctor was promising, it yielded well, its late maturity being favoured by the wet weather, and it gave a high malt-extract yield, but it showed a pronounced dormancy. Haisa II did well in England. Contrary to results in the previous year, Carlsberg II was a failure agriculturally and industrially.—M.P.

1102 Aufhammer, G. and Fischbeck, G. Ergebnisse internationaler Braugersten-Anbauversuche in Süddeutschland. [**Results of the international brewing barley cultivation trials in South Germany.**] *Z. Acker- u. Pflbau* 1956, **101,** 1/2, 22–34, bibl. 7, illus. [Inst. Acker- und Pflanzenbau, Weihenstephan, Bavaria]

Results from S. Germany of the 4-years' trials (1942–5) for the European Brewery Convention provided a comparison of the productivity of native brewing barleys with that of leading European varieties under Bavarian conditions. The varieties from maritime countries (Scandinavia) produced a thicker stand, shorter straw and a lower yield of straw than the German varieties. The German varieties were notable for resistance to mildew and the Swedish ones for resistance to lodging. The Danish Carlsberg gave the highest grain yield ; the leading German varieties and the Swedish Herta were almost as good ; all other foreign varieties fell far behind. The lowest protein yield was obtained from Carlsberg ; Bonus and Proctor also had low protein yields. Carlsberg combined a genetically-determined, low, protein yield with good growth characteristics. Results of malting tests showed the high extract value of the German short-grained Donaria and Wisa which, in spite of a medium protein content, yielded more extract than any other varieties tested. On Bavarian soils, selected German varieties contributed a higher proportion of malt extract than did the foreign varieties.—D.B.

1103 DIEUDONNÉ, P. and MOËS, A. Classification et identification des races d'orges cultivées en Belgique. [**Classification and identification of barley varieties cultivated in Belgium.**] *Bull. Inst. agron., Gembl.* 1944 [1956], **13,** No. 1–4, 139–206, bibl. 5, illus. [Sta. Rech. Amélior. Pl. de Grande Culture, Gembloux, Belgium]

Chapter 1 of this paper is a study of the vegetative, physiological and reproductive characters by which barley varieties are distinguished. Chapter 2 consists of a key to the classification of barley varieties and a detailed description (with photographs) of each of the 18 varieties cultivated in Belgium.—D.B.

1104 VILLENA, L. M. La identificación de " cultivars " en cebada. [**Cultivar identification in barley.**] *An. Esta. exp. Aula Dei* 1955, **4,** No. 1–2, 1–148, bibl. 12, illus., English summary.

Some characters of stem, spike and grain are studied in barley varieties of the collection of the Estación Experimental de Aula Dei, Spain, and a key is given for the identification of barley varieties according to these characters. A morphological description is given of the varieties studied.—E.B.O.

1105 ROBERTSON, J. H. and others. **Nevada results on spring barley and wheat variety trials.** *Circ. 5. Nevada agric. Exp. Sta.* 1954, pp. 11.

In trials during 1950–2 near Reno, highest mean yields of spring barley, grown under irrigated conditions, were given by Frontier, Velvon II, Hannchen and Trebi, with 3232, 2803, 2766 and 2590 lb. grain per ac., respectively. In trials with wheat during 1950–2, highest mean yields were given by Lemhi, Federation, Idaed and Big Club 43, with 2238, 2181, 2169 and 2143 lb. grain per ac., respectively.—P.J.B.

1106 VARELA M., R. El caso de la cebada en Colombia. [**Barley in Colombia.**] *Agric. trop., Bogota* 1956, **12,** No. 3, 171–3, illus.

On the cool plateaux of Colombia two crops of barley are grown per year on loam soils. The barley variety Funza, selected at the Agricultural Station at Tibaitatá, is under multiplication. It is hardy, early and high yielding, and its grain yield is 30% higher than that of the common varieties Pocha and Raspa.—E.B.O.

1107 PLUMET, H. Étude des facteurs conditionnant la qualité des orges de brasserie. [**Factors determining the quality of brewing barley.**] *Ann. Inst. nat. Rech. Agron., Paris. Sér. B. Ann. Amélior. Pl.* 1955, **5,** No. 4, 575–614, bibl. 27, illus. [Cent. Rech. Agron. Massif Central, Clermont-Ferrand]

A quantitative and statistical analysis has be made of the content of [nitrogen-free] extrac protein and glumes in brewing barley and the fluctuations in relation to variety and environme (especially temperature and rainfall). [N-fre Extract and glume content are varietal character but, in the varieties investigated, protein conte was not. There is a straight-line, inverse relatio ship between [N-free] extract and protein as function of the environment (especially climate and between [N-free] extract and glumes as function of variety. Brewing quality (low protei high N-free extract) is largely dependent climate ; certain of the basaltic plateaux in th Massif Central, especially the plateau Velay, are renowned for producing brewi barley. This is obtained only from adapte varieties, the best of which is Gloire du Ve (bred from the local barley). Crosses betwee Kénia and Trésor du Velay have resulted in ne varieties, e.g. Ponote and Étoile du Velay whic have improved yields.—D.B.

1108 WEBER, G. Die Korntestzahl, ein neue Beurteilungsfaktor bei der Bewertun unserer Braugersten. [**The grain-test numbe a new assessment factor in judging the valu of brewing barleys.**] *Saatgutwirtschaft* 195 **8,** No. 6, 176.

The grain-test number represents the distanc between grains on the ear stalk ; and is compute from several measurements. The lower the numbe the greater the value of the grain for brewin An example of the calculation is given. Th method is an objective one and is suitable fo evaluations carried out over several years by possibly, changing staff.—D.B.

1109 MITCHELL, F. S. and others. **The effect drum setting and crop moisture content o the germination of combine harvested barley** *Rep. 56. Nat. Inst. agric. Engng* 195 pp. 13.

The purpose of the experiment was to measure th effect on germination of combine harvesting crop of Plumage Archer barley at a number o drum speeds and concave settings over a range o crop moisture contents. The evidence points to range of 16–22% moisture content in which t harvest. Below 16% there is an increase in visibl damaged grains, above 22% a decline and at 28% a fall in total germination together with mor damage than can be seen by the naked eye. Such damage as can be seen is closely correlated, fo each moisture content group, with the number o grains showing mould growth during germinatio tests.—Authors' abstract.

1110 WALLACE, A. and ASHCROFT, R. T. **Correla tion of phosphorus and magnesium content**

of plants grown in synthetic ion-exchange resins. *Agron. J.* 1956, **48,** No. 5, 219–22, bibl. 5. [Sub-trop. Hort. Dep., Univ. California, Los Angeles]

Plants of 4 species, including barley, were grown in sand media containing ion-exchange resins, to provide a factorial combination of 3 levels of Mg and P. In plants with a low Mg requirement, which included barley, there was evidence that an increasing rate of Mg application was associated with increasing P contents in the plants, though this effect was clear only where the level of P treatment was high.—P.J.B.

1111 JONES, P. J. **A comparison of three varieties of barley at three levels of manuring.** *Exp. Husb.* 1956, No. 1, 10–17, bibl. 2, illus. [Norfolk Agric. Sta., Sprowston, Norwich]

The barley varieties, in order of earliness, were Kenia, Proctor and Spratt Archer. The levels of N manuring were 0, 1, 2 and 3 cwt. ammonium sulphate, which was applied at the time of drilling. All varieties were drilled on the same day at 2·5 bu. per acre. Earing and ripening were hastened by ammonium sulphate and grain yield increased markedly in all varieties ; at the 3 cwt. level the mean yield of all varieties was double that of the controls. Kenia and Proctor responded more than Spratt Archer to high levels of N. Lodging occurred during summer rainfall and became more severe at the higher levels of N ; Proctor showed the greatest resistance to lodging. The N content of the grain was lower than in the controls when 1 and 2 cwt. of sulphate of ammonia were applied, but it increased sharply as a result of 3 cwt. ammonium sulphate. However, rainfall is the most important factor in determining the N content of the grain ; at Sprowston, high April rainfall reduced the N content of the grain.—D.B.

1112 TUITE, J. F. and CHRISTENSEN, C. M. **Grain storage studies. 16. Influence of storage conditions upon the fungus flora of barley seed.** *Cereal Chem.* 1955, **32,** No. 1, 1–11, bibl. 20, illus. [Agric. Exp. Sta., Univ. Minn., St. Paul, Minnesota]

MAIZE

1113† KRESS, H. and MÜLLER, H. Die Landwirtschaft in der Volksrepublik Rumänien—unter besonderer Berücksichtigung ihres Maisanbaues. [**Agriculture in the Romanian People's Republic—with particular reference to maize cultivation.**] *Dtsch. Landw* 1956, **7,** No. 5, 232–7, illus.

The visit of an East German agricultural delegation to Romania in June, 1955 is reported. The experimental work in progress on field- and fodder-crops is outlined and particular attention is paid to the cultivation of maize for grain and fodder. Notes are given on the maize varieties of different maturity groups grown in Romania.—M.P.

1114 THOMAS, W. **Effect of plant population and rates of fertilizer nitrogen on average weight of ears and yield of corn in the South.** *Agron. J.* 1956, **48,** No. 5, 228–30, bibl. 9. [Alabama Agric. Exp. Sta., Auburn]

In trials in Alabama on Dewey silt loam, maize was grown at stand densities of (a) 6000, (b) 12,000 and (c) 18,000 per ac., in combination with N treatments of nil, 40, 80, 120, and 160 lb. of N per ac. as ammonium nitrate, side-dressed on 1 June. Adequate P and K were provided. Where no N was applied, plant populations (a), (b) and (c) resulted in grain yields of 80·6, 81·1 and 83·1 bu. per ac., respectively. N treatments resulting in the highest yields for the different plant populations were 40 lb. per ac. for (a), 160 lb. per ac. for (b), and 80 lb. per ac. for (c). Rates above 40 lb. N per ac. resulted in no material grain-yield increases. Average ear weights for plant populations (a), (b), and (c) were 7·6, 6·4 and 4·8 oz., respectively. N treatments had no significant effect on ear weights. —P.J.B.

1115 STIVERS, R. K. **Influence of interplanting of corn and ladino clover on the yields of corn.** *Agron. J.* 1956, **48,** No. 3, 97–8.

The total number of maize plants per ac. was held constant by varying the number of plants per hill in the following treatments :—(1) two maize rows 40 in. apart alternated with an 80 in.-wide cultivated area ; (2) two maize rows 40 in. apart alternated with an 80 in.-wide area containing two 20 in.-wide cultivated areas and one 40 in. width of ladino clover between them ; (3) maize rows 80 in. apart with two 20 in.-wide cultivated areas and one 40 in. width of ladino clover between them ; (4) maize rows 40 in. apart, conventional planting and cultivation. Treatments (2) and (3) reduced the yields of maize. N-deficiency symptoms and response to maize fertilization indicated that ladino clover [*Trifolium repens* var.] was competing with maize for available soil nitrogen. Average maize yields from treatment (3) were increased by approx. 13 bushels per ac. by application of 100 lb. per ac. of nitrogen. In the case of other treatments, the responses to nitrogen were not significant. The average distance that ladino clover grew towards cultivated maize rows, after cultivation ceased, was less than 6 in. when measured the following spring. This fact did not justify its importance as a winter cover for the cropped land.—P.M.G.

1116 GROGAN, C. O. **Detasseling responses in corn.** *Agron. J.* 1956, **48,** No. 6, 247–9, bibl. 8.

[Missouri Univ. Agric. Exp. Sta. and Bethlehem Agric. Res. Sta., O.F.S., Union of S. Africa]

Experiments were carried out in 1947 and 1948 in Missouri and in 1951–3 in S. Africa. In 1947, 2 strains were grown on fertile soil under dry conditions and in 1948 on both fertile and poor soil with ample moisture. In 1951–2 and 1952–3, 3 strains were grown at 12, 18 and 36 in. and 9, 18 and 36 in. spacings, respectively. It was found that detasseling these plants increased yield under conditions of drought, low soil fertility and above-optimum plant populations. There was also some indication that yields were more markedly increased in late-maturing crosses.—G.M.W.

1117 Russell, M. B. and Danielson, R. E. **Time and depth patterns of water use by maize.** *Agron. J.* 1955, **48,** No. 4, 163–5. [Illinois Agric. Exp. Sta., Urbana]

The results are reported of 2 years' studies on the use of water by maize grown under conditions of high fertility on a deep, permeable, brunizem soil in Illinois. Three soil moisture treatments were used, as follows : (a) water-impermeable cover on soil round plants, (b) natural rainfall from mid-June to mid-September (6·3 in. in 1953 and 7·4 in. in 1954) and (c) natural rainfall plus 8 in. of irrigation water in 1953 and 6·5 in. in 1954. Soil moisture contents were assessed at 2-week intervals from mid-June to mid-September at 6 in. intervals to a depth of 5 ft. Each treatment was also made to fallow land to determine water losses by evaporation. Under maize, there was a substantial reduction in soil moisture content throughout the whole 5 ft. profile. Summer rainfall and irrigation affected only the top 2 ft. of soil. The rate of water loss over the 12-week trial period for treatments (a), (b) and (c) was 26, 71 and 95%, respectively of the open-pan evaporation rate of 0·21 in. per day. Under treatments (b) and (c) the rate of soil moisture loss over the period of rapid development of the crop, during 16 July to 23 August, considerably exceeded the open-pan rate. The major zone of water depletion moved downwards progressively as the season progressed ; at the last sampling date, the crop obtained nearly all its moisture from below 4 ft. These trends were considerably complicated by the imposition of treatments (b) and (c).—P.J.B.

1118 Mota S. da, F. and Rosinha C., R. Ocorrência de sêca no período crítico do milho no Rio Grande do Sul. [**Occurrence of drought in the critical period for maize in Rio Grande do Sul (Brazil).**] *Bol. tec. 12. Inst. agron. do Sul* 1955, pp. 33, bibl. 27, illus., English summary.

A study was carried out to determine the frequency of drought in Rio Grande do Sul using Azzi's methods of agricultural ecology [see *F Crop Abstr.* 3 : 663]. In this State, maize is a important crop but its yields are often low becau of drought. Meteorological and agricultural da for many years and many localities were studie The critical period for maize, which lasts about month, occurs during November-February accor ing to locality. The drought-equivalent was fou to vary from 62 and 64 mm. of rainfall in th localities in which the critical period occurs November and December, to 100 and 90 in th localities in which it occurs in January an February. For the whole of the State the drough equivalent is 85 mm. The frequency of drought the State is shown on a map.—E.B.O.

1119 Peterson, J. B. **Continuous cultivation-its conservation significance.** *J. Soil Wa Conserv.* 1955, **10,** No. 6, 281–5, 302, bibl. 1 [Dep. Agron., Purdue Univ., Lafayette, I diana]

Soil deterioration is considered to have bee accelerated by early tillage practices. A review experimental data on the improvement of tilla practices shows that maize is not hard on the so and that the bad effects are due to inadequa fertilization and excessive tillage. Evidence sho that sweet clover (*Melilotus alba*) in rotatio increases maize yields compared with, for exampl 80 lb. N fertilizer per acre, and that corre placement of lime and fertilizer maintains pr ductivity. In management, emphasis is laid shredding maize stalks and leaving them as mulc —J.F.C.

1120† Snider, H. J. **A successful corn crop on th same land every year is a possibility.** *Be Crops* 1956, **50,** No. 1, 13–14, 39–40, illu [Decatur, Illinois]

Growing maize continuously on the same lan usually leads to a decline in yield. But, usin NPK, it has been shown possible to maintain constant high level, and to step up sharply th yield of continuously-grown maize. A considerab decline in soil organic matter occurs, however, an the tilth becomes destroyed. A new practice wide-row maize-planting is developing ; the inte lines are sown with grass and clover, or wit lucerne.—J.F.C.

1121 Haynes, J. L. and Thatcher, L. E. **Cro rotations and soil nitrogen.** *Soil Sci.* 195 **19,** No. 3, 324–7, bibl. 6. [Dep. Agron Ohio Agric. Exp. Sta., Wooster]

Records were kept at Wooster of the yield of maiz in 7 crop sequences over 39 years. In general, th yield level was correlated with the soil-N leve The data are presented as relative yields, th standard being an average of yields in those rota tions which neither gained nor lost N during th

period. It was shown that there were no long-term cumulative trends, upward or downward, in soil productivity during the commonly used maize-belt rotations, but that continuous maize cropping showed a marked downward trend. The introduction of a new rotation caused an increase or a decrease, followed by a stabilization of yield. The yield level was 8–10% higher in rotations containing an appreciable fraction of meadow crops such as lucerne. It was considered that economic factors rather than considerations of changes in producing capacity should be the basis of selecting cropping systems.—J.F.C.

1122 SWANSON, C. L. W. and JACOBSON, H. G. M. **The effect of soil hardness and compaction on corn growth.** *Soil Sci.* 1956, **20,** No. 2, 161–6, bibl. 12. [Connecticut Agric. Exp. Sta., New Haven]

Measurements of soil hardness were made over 3 years at various stages, from before spring ploughing up to the dent stage of maize. Maize yield was found to vary inversely with the force needed to penetrate the soil.—J.F.C.

1123 ANDREW, R. H. and others. **Maturation and yield of corn as influenced by climate and production technique.** *Agron. J.* 1956, **48,** No. 5, 231–6, bibl. 9. [Wisconsin Agric. Exp. Sta., Madison]

The results are given of trials to compare the performance of the double-cross hybrid maize varieties W240 and W255 grown at Wageningen in the Netherlands and at Spooner, Wisconsin, from 1950 to 1954. Average yields of W240 and W255 at Spooner were 62·9 and 63·3 bu. per ac., and 86·1 and 95·9 bu. per ac. at Wageningen. The average number of days from sowing to the 40% moisture stage was 80–85 at Spooner and 155 and 161 for the hybrids W240 and W255, respectively, grown at Wageningen. Average yields for the varietal hybrid Goudster at Wageningen were 99·4 bu. per ac. and days to maturity averaged 151. Data are given of latitude, day length, frost-free growing season, temperatures and precipitation at Wageningen and Spooner. In terms of moisture content, the hybrids took 66 days longer at Wageningen than at Spooner to reach the same stage of development ; in terms of maximum dry weight, the difference was 52 days. Factors contributing to the higher grain yields at Wageningen were higher plant populations (28,907 per ac., compared with 11,784 per ac. at Spooner), the more uniform distribution of rainfall, higher soil fertility and lower incidence of disease.—P.J.B.

1124 HENKELJ, P. A. and others. [**The effect, on maize development and ripening, of subjecting the seed to fluctuating temperature.**] [Russian] *Fiziol. Rast.* (*Pl. Physiol. USSR*) 1955, **2,** No. 5, 447–53, bibl. 12, illus. [Bot. Dep., Moscow Province Pedagogic Inst.]

In order to extend maize sowings to northern latitudes in the USSR, there is a need for seed which has been produced in northern regions. The authors' studies are concerned with means by which maize growth and development can be accelerated so that seed can be obtained to produce silage crops in the Moscow Province. The maize variety Rjadova was sown (in pockets spaced at 70 × 70 cm.) on 337m.², seed being placed at a depth of 7–8 cm. The object of the tests was to determine the effect on subsequent plant hardiness of subjecting the seed to the following variants : (1) control, no treatment ; (2) hardening after soaking (50% water to air-dry wt. of seed) during 1 day and then placing on ice for 3 weeks at 0 to −1°C. ; (3) hardening after soaking (35% water to air-dry wt. of seed) for 1 day, and then maintained during 3 weeks at temperatures alternating between that of ice and of a room at 18–20°C. half-a-day under each. The sowings were made on 25 May and seedlings appeared 13 days later. The data show that treatments (2) and (3) accelerated growth and development, in addition to improving yields. Treatment (3) was the most beneficial, the total ripe grain yield being 66% above the control, while treatment (2) resulted in 30% increase above the control. Treatment (3) increased germination percentage in the field (average results of 3 replications, 80% compared with 70% in the control). There is evidence that viscosity of protoplasm at the vegetative phase of development in plants of (2) and (3) is greater than that of the control ; at the flowering phase a sharp decline in viscosity occurs in the chilled plants, while in the control this decline is less acute. —M.H.

1125 MIHALOVSKIĬ, A. G. and MELJNIK, T. D. [**Hastening development and ripening of maize by means of vernalizing the seed.**] [Russian] *Zemledelie* (*Agriculture*) 1956, **4,** No. 4, 91–3.

The extension of maize sowings into northern latitudes has shown the need for producing new varieties which are both high-yielding and early-ripening. Tests made on the experimental fields of the Ukrainian Agricultural Academy with sowings of vernalized and unvernalized seed of the comparatively early-ripening variety Minnesota 23 Harjkovskaja are reported. The seed was soaked (100 parts by wt. of grain in 35 parts water) for 36 hours and then covered with moist sacking for 10–12 hours to ensure complete imbibition. The soaked grain was vernalized at 5°–8°C. (and stirred occasionally) during 15, 25 and 35 days. The tests also included vernalization of maize seed previously moistened with a solution of copper

sulphate (0·008% concentration). This treatment increases respiration intensity and hastens growth processes. The seed was sown (6 May) in square pockets (60 × 60), the sowings being thinned, after emergence, to 2 plants per pocket. The data show that grain moistened with copper sulphate and vernalized for 15 days gave the best results ; e.g., the yield of ripe cobs (kg./ha.) was 4430 and 4230 after vernalization for 25 and 35 days, respectively, and 4760 after vernalization for 15 days in the variant where grain was previously moistened with copper sulphate.—M.H.

1126 HARPER, J. L. and LANDRAGIN, Phyllis A. **The influence of the environment on seed and seedling mortality. 4. Soil temperature and maize grain mortality with especial reference to cold test procedure.** *Plant and Soil* 1955, **6,** No. 4, 360–72, bibl. 14, illus. [Dep. Agric., Univ. Oxford]

Blight-mortality of maize between sowing and 50% emergence was found to be due to *Gibberella zeae, Pythium* and other soil-pathogens. At 0°C., frost damage also occurred. Two methods of germination in soil gave similar results. Mortality increased as temperature decreased. It also increased with time of exposure up to 10 days. The rate of mortality-change at 3–8°C. was low compared with that at 8–15°C. Two days' pre-treatment at 20°C. did not alter the effect of subsequent pretreatment at 3–20°C. Varietal differences increased with time.—J.F.C.

1127 NEPTUNE, G. **Cold tolerance studies with hybrid seed corn.** *Diss. Abstr.* 1956, **16,** No. 2, 203. [Michigan State Univ.]

Samples of seed of 2 cold-susceptible and 3 cold-tolerant double-cross maize hybrids were used. The seed was treated with a fungicide, and, immediately after sowing, was exposed to warm temperatures for nil, 1, 2, 3 or 5 days, before exposure to temperatures of 32°F. or 40°F., for 4, 8, 12 or 16 days. Seed germination decreased as the length of exposure to the warm temperatures increased above 1 day ; 3 days of such treatment before exposure to cold reduced mean germination in both types of hybrid by half. Pre-cold treatments of nil or 1 day before exposure to 32°F. resulted in less injury than exposure to 40°F. Where the pre-cold treatments were extended for longer periods, this trend was reversed. The tolerance of the cold-resistant hybrids under cold, wet, soil conditions was consistently better than that of the non-resistant hybrids. The germination of the cold-tolerant hybrids was not seriously impaired by exposure to either 32°F. or 40°F., regardless of the stage of germination of the seed.—P.J.B.

1128 RILEY, E. A. **Weed control in maize in Northern Rhodesia.** *Pest. Abstr. News Summ. Sect. C., Lond.* 1956, **2,** No. 2, 54–6 [Mt. Makulu Res. Sta., Lusaka, and Mu alaikwa Agric. Sta.]

The action of MCPA, as a pre-emergence herbici for maize, was compared with normal cultivati and assessed by grain yield. Two sites were chos for soil contrast. The treatments were : 0, 1 a 2 lb./ac. MCPA, at 0 and 6 days after planting wi 0, 1 and 2 cultivations. In one site infested wi *Eleusine indica,* although increasing applicatio of MCPA increased yields, one cultivation alo had more than double the effect of the 2 lb. rate MCPA alone. Cultivation alone gave the maximu yield. Second-year results were in marked co trast ; 1 lb. MCPA was equal to one cultivatio 2 lb. were no better, and 2 cultivations were better than one. At the other site containing broa leaved weeds, MCPA reduced the weeds up harvest, but did not improve the yield. One cul vation was best. In the 2nd year, waterloggi ruined the experiment.—J.F.C.

1129 da SILVA, J. B. V. **Leaf blight and yield in inbreds of two varieties of maize.** *S. Afr. Sci.* 1956, **52,** No. 10, 226, bibl. 2. [No Lisboa, Angola]

In trials with S_1 inbreds of Amarelo Laranja a Branco Redondo, in the central plateau of Angol a correlation was found between yield and resis ance to *Helminthosporium turcicum.* Two hyp theses appear possible : low vigour involvi lower yield is genetically linked with lower sistance to *H. turcicum,* or that lower yield caused by blight lesions affecting the assimilato capacity of the plant.—M.P.

1130 COAKER, T. H. **An experiment on stem bo control on maize.** *E. Afr. agric. J.* 1956, No. 4, 220–1, bibl. 2. [Emp. Cott. Gr. Co Cott. Res. Sta., Namulonge, Uganda]

DDT dust at 20 lb. per ac. applied three times fortnightly intervals either down the leaf funn of each plant or as a 'blanket' treatment, co trolled stem borer satisfactorily by reducing t larval population significantly, but lodging a final yields appeared to be unaffected.—M.P.

1131 KIRK, V. M. **Control of billbugs on corn South Carolina.** *J. econ. Ent.* 1956, **49,** No. 233–6, bibl. 4. [Carolina Agric. Exp. St Florence]

In the USA, considerable losses in maize stan are caused every year by billbugs (mainly *Calend maidis* and *C. callosa*). Three fields, heavily fested with billbugs, were treated before sowi with a broadcast, disced-in application of Aldr at the rate of 2 lb. of actual toxicant per ac. Th treatment resulted in virtual eradication of t billbugs in 2 of the fields and excellent control

the third, whereas nearby control fields lost 51–62% of their stands.—E.B.O.

1132 RICH, S. **Seed treatments to protect corn seedlings against Stewart's wilt.** *Pl. Dis. Reptr* 1956, **40,** No. 5, 417–19, bibl. 7. [Connecticut Agric. Exp. Sta., New Haven]

A number of antibiotics, growth-regulating compounds and other compounds possessing chemotherapeutic activity were used to treat maize seed for the control of Stewart's wilt, caused by *Bacterium stewartii*. The seed was soaked overnight in solutions of these substances. Streptomycin at 800 ppm., Terramycin at 400 ppm., Captan at 2000 ppm., 2,4,6-T at 50–400 ppm., and Crag I Herbicide (Na 2,4-dichlorophenoxyethyl sulphate) at 50–400 ppm. all significantly reduced the incidence of wilt in seedlings grown from the treated seed. Of a number of dry seed treatments, only HD-160 (Na S-(2-benzothiazolyl) thioglycolate) resulted in a significant reduction of wilt.—P.J.B.

1133 DANIELSON, R. E. **Ion absorption by corn [maize] roots as influenced by moisture and aeration conditions.** *Diss. Abstr.* 1956, **16,** No. 2, 201. [Univ. Illinois, Urbana]

1134 GINGRICH, J. R. **Effect of soil moisture stress and oxygen concentration on the growth of corn [maize] roots.** *Diss. Abstr.* 1956, **16,** No. 2, 202. [Univ. Illinois, Urbana]

1135 HOWE, O. W. and RHOADES, H. F. **Irrigation practice for corn production in relation to stage of plant development.** *Soil Sci.* 1955, **19,** No. 1, 94–8, bibl. 12. [Nebraska Agric. Exp. Sta., Lincoln]

Thirteen irrigation treatments were carried out to study the importance of maintaining a low soil-moisture tension during different stages of maize development. Soil moisture was determined at the beginning, before and after each irrigation. Plant sampling was begun 33 days after sowing and repeated in some cases at weekly intervals. Graphs are given showing the effects of the treatments on plant height, total dry-matter and on ear weight. A low soil-moisture tension throughout the growing season was found to be essential for maximum vegetative growth and grain yield. Where a high soil-moisture tension was alleviated by irrigation during the tasseling period, there was an appreciable effect from that irrigation on grain yield, but the yield was appreciably lower than when a low tension was maintained throughout.—J.F.C.

1136† HARROLD, L. L. **Evapotranspiration rates for various crops.** *Agric. Engng, St. Joseph, Mich.* 1955, **36,** No. 10, 669–72, bibl. 6, illus. [Soil and Water Conserv. Res. Sta., U.S. Dep. Agric., Coshocton, Ohio]

Evapotranspiration rates were recorded over three years on stands of maize and lucerne/timothy pasture using data from lysimeters and fibreglass-gypsum electrical-resistance blocks. Consumptive-use rates for lucerne/timothy reached high values in May and June as compared with the maximum in July and August for maize. For unirrigated crops, evapotranspiration rates were sometimes low because of deficient soil-moisture supplies. Average peak-use rates for 10-day periods for maize exceeded the average monthly values by as much as 0·04 in. per day without irrigation, and by 0·14 in. per day with irrigation.—G.M.W.

1137 SOUBIÈS, L. and others. Une difficulté particulière à la fertilisation azotée du maïs et le moyen d'y remédier. [**A particular difficulty in the nitrogenous fertilization of maize and the method of overcoming it.**] *C.R. Acad. Agric. Fr.* 1956, **42,** No. 5, 246–50, bibl. 5. [Sta. Rech. Agron., O.N.I.A. Toulouse]

The experiments reported in this paper confirmed that the critical period in the N-nutrition of maize, particularly in a dry season, is just prior to flowering. Pot trials indicated that the optimum time for N-application was 1 week before flowering. In field trials, N in the form of granulated urea was injected into the soil to a depth of 15–20 cm. by means of a modified tractor-drawn hoe, 4 weeks before the onset of flowering. The beneficial effect of the N-application to the maize plant was evident in leaf colour, ear growth and grain yields. The yield of the maize crop receiving 80 kg. N was slightly superior to that receiving 40 kg. N per ha., and both were markedly superior to the unfertilized controls. In a dry year this form and method of fertilizer application had the advantage of placing the N where it was most needed in a readily-available form.—M.P.

1138 MALAVOLTA, E. and others. Aproveitamento de alguns adubos fosfatados pelo milho (*Zea mays*) e pelo arroz (*Oryza sativa*) em terra roxa misturada. [**Advantage from applying some P fertilizers to maize (*Z. mays*) and rice (*O. sativa*) in mixed red earth.**] *Rev. Agric., Piracicaba* 1955, **30,** No. 7–12, 185–97, bibl. 7, English summary. [Esc. Agric. Luiz de Queiroz, São Paulo, Brazil]

A field trial was carried out on red earth derived from basalt to study the effect on the grain yield of maize of applying 3 different P fertilizers, each at 83·3 and 200 kg. of P_2O_5 per ha. Statistical analysis of the results showed that : (a) all the treatments were superior to the control ; (b) there was no significant difference between the 2 rates of a given fertilizer ; (c) Florida rock phosphate (31% P_2O_5) did not differ significantly from superphosphate (20% P_2O_5) both being better than Algerian rock phosphate (27% P_2O_5).—E.B.O.

1139 HUTTER, W. Fumure et irrigation des maïs hybrides. [**Manuring and irrigation of hybrid maize (in Morocco).**] *Terre maroc.* 1956, **30,** No. 317, 107–15. [Cent. Rech. Agron., Rabat]

1140 HAYLETT, D. G. and THERON, J. J. **Studies on the fertilisation of a grass ley.** *Sci. Bull. 351. Dep. Agric. S. Afr.* 1955, pp. 33, bibl. 8, illus. [Agric. Res. Inst., Pretoria]

The results of a 7-year factorial experiment on the fertilization of an established pasture of *Chloris gayana* and *Paspalum dilatatum* are reported. The residual effects of the fertilizers on maize production were studied for a further period of 3 years. There was a slight residual effect of superphosphate, applied to the grass, on maize grain yields. Up to 1000 lb. ammonium sulphate per morgen [1 morgen = 2·116 ac.] reduced grain yields slightly, but 2000 lb. of the fertilizer decreased grain yields by about 8 bags [1 bag = 200 lb.], due to increase in soil acidity. A direct application of superphosphate had no effect on the maize crop during the second year after grass, but in the third season, superphosphate increased grain production, especially where no P had been used on the grass. Two tons of lime per morgen raised the pH of the soil, and maize yield increases were noted. The applications of the results to the introduction of a grass ley in rotation with annual crops are discussed.—From authors' summary.

1141 JORDAN, H. V. and others. **Some effects of kudzu versus continuous corn on soil properties and crop yields.** *Soil Sci.* 1956, **20,** No. 2, 225–7, bibl. 5. [Soil and Water Conserv. Br., Agric. Res. Serv., U.S. Dep. Agric., and Mississippi Agric. Exp. Sta., State Coll., Miss.]

For the improvement of a soil having a weak pan, the deep-rooted legume kudzu (*Pueraria thunbergiana*) was introduced for 4 years in rotation with maize. Compared with soil under continuous maize, N, organic C and exchangeable K down to 12 in. were increased. Maize following kudzu increased substantially in yield and rooted more deeply (P^{32} indicator used).—J.F.C.

1142 MILES, S. R. and REMMENGA, E. E. **Relation of kernel, cob, and ear moisture in dent corn [maize].** *Ext. Bull. 399. Purdue agric. Exp. Sta.* 1954, pp. 11.

Data are given for estimating ear moisture from kernel moisture contents, where ears are taken from standing crops in the field, or from storage.—P.J.B.

SORGHUM AND MILLET

1143 ROSS, W. M. and LAUDE, H. H. **Growing sorghums in Kansas.** *Circ. 319. Kansas agric. Exp. Sta.* 1955, pp. 20, illus.

Practical recommendations are given for growing sorghum in Kansas. Aspects reviewed include seed-bed preparation, seed treatment, rate and date of sowing, cultivation and weed control, irrigation and varieties recommended for Kansas.—P.J.B.

1144† THURMAN, R. L. and STATEN, R. I. **Sorghum yield experiments 1950 to 1954.** *Rep. Ser. 46. Arkansas agric. Exp. Sta.* 1955, pp. 19, bibl. 10.

Among dwarf combine-type varieties of grain sorghum, Plainsman and then Martin were the most widely adapted and highest yielding. Grain sorghums grown in 20 in. rows produced higher yields than when grown in 40 in. rows, but weed control was then a major problem. Oat yields were lower after tall sorghums than after soyabeans and lespedeza, but not after dwarf grain sorghums. Soyabean yields were higher (42 %) after sorghum than after soyabean and lespedeza.—J.F.C.

1145 CHAVAN, V. M. and others. **A note on the optimum spacing and seed rate of rabi jowar for the scarcity area.** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 115–16.

From trials with Maldandi 35–1 jowar (*Sorghum vulgare*) as a winter crop, a seed rate of 4 lb. per ac. is recommended at row widths of 12, 15 or 18 in.—M.P.

1146 CHAUGULE, B. A. **A note on rotational experiments on bajri and jowar (Nilwa).** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 139–41.

Nilwa sorghum grain yields were unaffected either by ploughing or by harrowing the land, but were increased by applying 5 cart-loads F.Y.M. per ac. with and without ploughing, when the sorghum was grown in rotation with cotton. 15–18 in. of rainfall during the growing period was beneficial for, but 21–9 in. was harmful to, grain yields. The effect of a legume (groundnuts, soyabeans or *Sesamum indicum*) in rotation with bajri (*Pennisetum typhoideum*) are discussed. Bajri/legume each year or bajri after soyabeans were the best rotations. Groundnuts and *S. indicum* appeared to be unsuitable.—M.P.

1147 CHAVAN, V. M. and others. **Seed rate and spacing in bajri (*Pennisetum typhoideum* (Burm.) S. and H.) in Bombay State.** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 168–71, bibl. 2.

For rainfed bajri crops, the strain AF3, a seed rate of 4 lb. per ac., with inter-row spacing of 15–18 in. was best.—M.P.

148 CHAUDHARI, B. B. **Studies on the effect of grading seed of bajri (*Pennisetum typhoideum* (Burm.) S. and H.).** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 164–7, bibl. 4.

The grading of seed had no effect on the growth, development and grain yield of *P. typhoideum*, whether the seed was drilled or dibbled.—M.P.

149† CHAVAN, V. M. and KAJJARI, N. B. **Seasonal behaviour of kharif and rabi jowar types (*Sorghum vulgare* Pers.).** *Poona agric. Coll. Mag.* 1956, **46,** No. 2 and 3, 99–103, bibl. 1.

The performance of kharif (monsoon) and rabi (winter) jowar types under different seasonal conditions during 1951–4 is tabulated. The kharif varieties on trial were Kanvi Local and Fulgar White; the rabi varieties were Maldandi 35–1 and Yanigar. A spacing of 15 in. × 8 in. was used for the monsoon crops and 18 in. × 12 in. for the winter crops. Rabi types grown in the kharif season were mainly vegetative, took 3 weeks longer to flower, yielded less grain, were nearly twice as tall and produced nearly 2·5 to 3 times more fodder than in the rabi season. Kharif types grown in the rabi season flowered 2 weeks earlier, tillered more, gave double the grain yield, but only a third of the fodder yield, and were less tall than in the kharif season. The length of the growth period was directly proportional to the total dry-matter production. Yanigar gave the greatest yield of fodder in both seasons.—M.P.

150 CHAVAN, V. M. and others. **Improvement in Kanvi jowar a typical early kharif jowar variety of Dharwar district.** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 84–6, bibl. 2.

The improved strains K588 and K205–2 were superior in grain yield to the local strain of Kanvi jowar (*Sorghum vulgare*), in farm and district trials from 1952–5, when grown as a monsoon crop. K205–2 was also drought-tolerant.—M.P.

151 CHAVAN, V. M. and others. **Improved Yanigar jowar, a rabi variety for Dharwai district.** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 87–90, bibl. 3.

The strain Y417–5 was superior in grain and fodder yields to the local Yanigar strain of *S. vulgare*, and matured 1 week earlier. Y2 was also promising as a winter crop.—M.P.

152 KARPER, R. E. **New Hegari adapted to combine harvesting.** *Seed World* 1956, **78,** No. 11, 70, illus. [Texas Agric. Exp. Sta., College Station]

Combine Hegari was produced by the Texas Agricultural Experiment Station. It is similar in all characteristics to Hegari, except that it is dwarf in height and is suitable for combine harvesting.—P.J.B.

1153 CHAVAN, V. M. and SHENDGE, P. Y. **Trials of American milos in Bombay.** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 104–6, bibl. 4.

Trials in which the American varieties Summer 6550, White Sooner Milo, Duf Comb Milo, and Double Dwarf Milo were compared with the local *Pennisetum typhoideum* are reported. Duf Comb Milo yielded well in most areas, but it matured 2–4 weeks later than bajri, was susceptible to rust and its grain was of lower nutritive value.—M.P.

1154 MAJMUDAR, J. V. and KHUNTE, P. D. **Improved strains of kodra (*Paspalum scrobiculatum* Linn.) for Gujarat.** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 183–5.

The agronomic characters, grain yield and chemical analyses of the strains 494–1 and 80–2 are tabulated and discussed.—M.P.

1155 SANDERS, E. H. **Developmental morphology of the kernel in grain sorghum.** *Cereal Chem.* 1955, **32,** No. 1, 12–25, bibl. 11, illus. [Corn Products Refining Co., Argo, Illinois]

Growth of the endosperm, seed coat and pericarp was traced from the time of pollination until maturity.—From author's abstract.

1156 NAIK, M. S. and ABHYANKAR, V. S. **Nutritive value of improved strains of jowar (*Sorghum vulgare* Pers.).** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 130–7.

Figures showing proximate analyses, mineral analyses, phytin P, starch and sugar contents, and starch digestibility are tabulated for 17 varieties of jowar. The figures are discussed.—M.P.

1157† ILJIN, W. S. Influencia del agua sobre la asimilación de sales del suelo por las plantas. [**Influence of water on the assimilation of soil salts by plants.**] *Rev. Fac. Agric., Caracas* 1955, **1,** No. 4, 371–84, bibl. 41. [Fac. Agric., Univ. Cent. de Venezuela, Maracay]

This article reviews the literature on the subject and gives an account of investigations by the author mainly on sorghum (*Sorghum vulgare*). Sorghum plants were grown under normal conditions and also on low-lying plots with an excess of rain water. After 161 days from sowing, the normal plants yielded 23,972 kg. of dry matter per ha. and the plants grown with an excess of water 13,997 kg. Data of chemical analysis showed that the plants grown with an excess of water had lower percentages of N, P, K, Mg and Ca, and higher percentages of carbohydrates, than the normal plants.—E.B.O.

1158 WEAR, J. I. **Effect of soil pH and calcium on uptake of zinc by plants.** *Soil Sci.* 1956, **81,**

No. 4, 311–15, bibl. 18. [Alabama Polytec. Inst., Auburn]

The results of greenhouse trials with sorghum showed that applications of $CaCO_3$ to increase soil pH values from 5·7 to 6·6, decreased the Zn content of the plants, and that this effect was due to a change in soil pH values, rather than to the specific effect of Ca.—From author's summary.

1159 McIlrath, W. J. and deBruyn, J. A. **Calcium-boron relationships in Siberian millet.** *Soil Sci.* 1956, **81,** No. 4, 301–10, bibl. 20. [Univ. Chicago, Illinois]

Studies were made on the growth and chemical composition of *Setaria italica* plants grown in nutrient solutions containing Ca concentrations ranging from 40 to 480 ppm., in combination with B concentrations ranging from nil to 50 ppm. Symptoms of B toxicity developed in plants receiving more than 5 ppm. B and of Ca deficiency in plants receiving 40 ppm. Ca. B concentrations between nil and 0·5 ppm. had no significant effect on the dry weights of roots and tops, irrespective of Ca treatment. At concentrations of 160 and 320 ppm. Ca, 5 ppm. B resulted in significant, and 50 ppm. B in highly significant, decreases in dry weights. The Ca/B ratio of the plants, in general, increased with increased Ca concentrations and decreased with increased B concentrations.—P.J.B.

1160 Chavan, V. M. and Patil, J. A. **Manurial experiments on bajri (*Pennisetum typhoideum* (Burm.) S. and H.) in Bombay State.** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 151–6, bibl. 2.

The bajri strain 28–15–1 was grown under rain-fed conditions with 26 manurial treatments in factorial randomized block experiments at Niphad. The crop was sown at 4 lb. per ac. and F.Y.M., N and P were applied. The beneficial effect of a basal dressing of 5 cart-loads F.Y.M. per ac. was noted. Grain yields rose with increasing dressings of N, but were highest with a mixture of 60 lb. N + 40 lb. P_2O_5 per ac. Maximum response to P alone, was obtained with applications of 20–40 lb. P_2O_5 per ac. Results were also dependent on the rainfall.—M.P.

1161 Poona Agricultural College Magazine. **Special Millet Number.** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 69–259.

Articles published include :

1. A brief review of research work done on jowar (*Sorghum vulgare* Pers.) in Bombay State. By S. P. Pandya and others, pp. 79–83.

2. Investigations on the problem of successful growing of millet crops in the scarcity areas of Bombay State. By S. S. Sirur and L. Sreenivas, pp. 107–9.

3. Manurial experiments on rabi and kha millets in the dry zone of Bombay State, S. S. Sirur and others, pp. 122–3.

4. Note on the intensive method of cultivation jowar in East Kandesh. By R. D. Gaitond pp. 126–7.

5. Intensive method of cultivation of na [*Eleusine coracana*] in Bombay State. By V. Chavan and P. V. Shendge, pp. 180–2.

6. Insect pests of millets in Bombay State a their control. By M. V. Kadam and G. A. Pat pp. 186–7.

7. Improved strains of millets for Bombay Stat pp. 206–8. Relevant details are tabulated for t cultivation of strains of *Sorghum vulgare, Penn setum typhoideum, Eleusine coracana* and *Setar italica.*

8. Relative food values of a few foodgrai (cereals), p. 209.

9. Chemical analysis of improved strains millets, pp. 210–11.

10. Bibliography of jowar (*Sorghum vulgare* Pers pp. 215–43. 698 references.

11. Bibliography of bajri (*Pennisetum typhoideu* (Burm.) S. and H.), pp. 244–5. 33 references.

12. Bibliography of nagli (*Eleusine coracana* (Linn Gaertn.), pp. 245–7. 50 references.

13. Bibliography of rala (*Setaria italica,* Beauv pp. 248–9. 36 references.

14. Bibliography of other millets, pp. 250–4. references. [See also Abs. 1145–1151, 1153, 115 1156 and 1160.]—M.P.

1162 Portères, R. Les céréales mineures genre *Digitaria* en Afrique et en Europ [**The minor cereals of the genus *Digitaria* Africa and Europe.**] *J. Agric. trop. et B appl.* 1955, **2,** No. 7–9, 10–11 and 12, 34 86, 477–510 and 620–75, bibl. 154, illus.

This work deals mainly with *Digitaria exilis,* whi is grown for human consumption over a wide ar in West Africa, where it is known as fonio, fun acha or by other local names. Its area of cultiv tion corresponds very closely to that of *Ory glaberrima* and is limited to the east by that *Eleusine coracana. D. exilis* is a low-yielding cr and is reputed to encourage soil erosion. Althou the growing of this crop is slightly on the decreas it is still of such importance that some work shou be done to improve it. The considerable inform tion given on *D. exilis* is concerned with t following principal points : history, synonym botanical description, germination, seedling d velopment, vernacular names, crop areas, varieti cultural methods, harvest, yield and uses. I formation is also given on *D. sanguinalis* a *D. iburua,* both grown to a limited extent (t former also in Europe). *D. exilis* is mostly gro on poor soils and is generally not included in t crop rotations. A collection of varieties of

ilis and *D. iburua* was made from the territories French West Africa. A study of the varieties of *exilis* revealed a remarkable uniformity in orphological characters. A key is given for the entification of the varieties and subvarieties of is species.—E.B.O.

ICE

163 KOSHIRY, A. **Rice in Egypt.** *Publ. Agric. Extn Dep. Minist. Agric. Egypt* 1956, pp. 8.
iitable cultural methods for rice in Egypt are tlined. Sowing in nurseries should be carried out rly in May, followed by transplanting 5 weeks ter. The varieties recommended are Yabani 47 r fertile land in the north, Agami 1 on newly claimed land, and U.S. 3 for the Nili crop (sown the second half of July) in the Fayoum Pronce. Other standard varieties are Yabani Pearl, abani 7 and Giza 14.—M.P.

164† VELIČKO, E. [**Problems of rice sowings in the Kuban.**] [Russian] *Soc. seljs. Hoz.* (*Social. Agric.*) 1955, **26,** No. 8, 62–6.
ice was first sown in the Krasnodar Territory in 931. The area under this crop in 1955 amounted about 20,000 ha., this figure being exceeded in ie Soviet Union only by Kazahstan and Uzbek SR. In most Asiatic countries rice is grown in onoculture but harvests have not improved much eyond the average yield of 1577 kg./ha. obtained 1922. In the Kuban, long-term experiments –9 years) have shown that consistently high ields are obtained by a rice rotation which includes erbage sowings. For example, during a 9-year st in which rice was sown in rotation with a cerne/ryegrass mixture [relative duration of the urses and proportions of mixture not given], the nnual] harvest of rice was 5224 kg./ha. In a otation (8 years) with a clover/timothy mixture, ie [annual] rice harvest was 5311 kg./ha. while ce in monoculture for 17 years gave an [annual] ield of 2645 kg./ha. (during 5 years of the obseration).—M.H.

165 PENNY, J. M. Melhor período de plantação. [**The best sowing period (for rice).**] *Lavoura arroz.* 1955, **9,** No. 106, 19–20. [Esta. Exp. Arroz, Gravataí, Brazil]
rom 11 years' trials to determine the best sowing eriod for 7 varieties and 4 selections of rice in Rio rande do Sul, it appeared that there is a critical owing period, for both early and late varieties, hich results in the highest yields ; this is 15–30 ct.—E.B.O.

166 PAWAR, M. S. and others. **Dibbling of sprouted paddy.** *Rice News Tell.* 1955–6, **3,** No. 4 and **4,** No. 1, 16–22. [Dep. Agric., Hyderabad]
In a small-scale experiment (not replicated), dibbling sprouted seed required only 20 lb. seed per ac., as against 80 lb. by the broadcast method. The dibbling, or Japanese, method resulted in yield increases of 21% grain and 26% straw and the cost of weeding was reduced.—P.M.G.

1167 FAZULLAH KHAN, K. and KANNAN, R. **A note on the double cropping of paddy in Wynad.** *Madras agric. J.* 1956, **43,** No. 3, 108–9, bibl. 2. [Agric. Res. Sta., Ambalavayal, Madras]
The most profitable combination was Kothandan 517 grown as the first crop, followed by Palthondi 9114.—P.M.G.

1168 PORTÈRES, R. Nouvelles variétés agrobotaniques de riz cultivés, *Oryza sativa* L. et *O. glaberrima* St. [**New agro-botanical varieties of cultivated rice (*Oryza sativa* and *O. glaberrima*).**] *J. Agric. trop. et Bot. appl.* 1955, **2,** No. 12, 573–99.
An annotated list is given of rice varieties, mostly grown in West Africa. Brief descriptions are given. —E.B.O.

1169 PORTÈRES, R. Un problème d'ethnobotanique : relations entre le riz flottant du Rio-Nunez et l'origine médinigérienne des Baga de la Guinée Française. [**An ethnobotanical problem : relationship between the floating rice of Rio-Nunez and the provenance of the Baga of French Guinea from the Central Delta of the Niger.**] *J. Agric. trop. et Bot. appl.* 1955, **2,** No. 10–11, 538–42, bibl. 12.
Baga-malé (Rice of the Baga) is a floating variety of *Oryza glaberrima*, grown by the Baga of French Guinea. It is hardy, of medium productivity and has a vegetative cycle of 180–195 days. It must be grown in water at least 0·60 m. deep, and can stand rises in water level up to 1·50–1·70 m., its stems being 2 m., or more, long. It appeared from this study that the 5 forms of Baga-malé are present in the variety Boussa Diambou of the Central Delta of the Niger.—E.B.O.

1170 PAWAR, M. S. and RAJAGOPALAN, K. **Improved strains of rice evolved at Rudroor.** *Rice News Tell.* 1955–6, **3,** No. 4 and **4,** No. 1, 23–5. [Dep. Agric., Hyderabad]
RDR. 4, RDR. 7 and RDR. 2 are 3 improved strains, of which the first two now occupy about 20,000 acres in the Nizamabad district. RDR. 4 requires 165 days to mature and is harvested in the second half of November. It gives an average yield of 3000 lb. of white, medium quality rice per ac. RDR. 7 is sown in May-June and harvested in mid-September, or sown in January and harvested in April, and gives an average yield of 2000 lb. of

white, easily polished rice per ac. RDR. 2 takes 125 days to mature and gives an average yield of 2500 lb. of long, medium, dull-white rice per ac.—P.M.G.

1171 NEGI, L. S. and SAINI, S. S. **Wild rice problem in Kangra and its control.** *Rice News Tell.* 1955–6, **3,** No. 4 and **4,** No. 1, 5–15, bibl. 5. [Dep. Agric., Punjab]

Purple-leaved varieties of cultivated rice are being developed in order to differentiate this from wild rice which, in the Kangra district of the Punjab, causes severe losses by invading rice fields.—P.M.G.

1172 ROJAS P. de, E. El combate del arroz rojo con hormonas en los terrenos infestados. [**The control of red rice by hormonal treatment in infested soils.**] *Agric. trop., Bogota* 1955, **11,** No. 11, 853–64. [Fed. Nac. Arroceros, Colombia]

A series of trials was carried out to test several preparations for the control of red rice in rice fields. Results indicated that each of the following preparations, applied at the amounts (kg. per ha.) of active substance, gave practically 100% control of red rice and other weeds : Etoxyl, 14 ; Na salt of 2,4-D plus MCPA, 7 + 6 ; Na salt of 2,4-D plus Karmex W, 5 + 3 ; UD-55, 9 ; Na salt of 2,4-D plus TCA, 7 + 15 ; Na salt of 2,4-D plus Karmex W, 8 + 2 ; and Na salt of 2,4-D plus TCA, 4 + 20. These preparations were in powder form or fine crystals, and were mixed with different amounts of inert substance (kaolin or rice husks) so that a total of 100 kg. per ha. was applied in each case. It is concluded that by treating the soil with one of these preparations it is possible to destroy all the seeds of red rice and other weeds without damaging the rice seed, which is sown 2 weeks after the treatment. To give complete control the preparation should penetrate into the soil to a depth of at least 12 cm. This is achieved by supplying irrigation water if rain does not occur. It is calculated that the cost of this treatment is 20% only of the profit it gives.—E.B.O.

1173 LAVOURA ARROZEIRA. Gramíneas nas lavouras de arroz. [**Grasses in rice cultivation.**] *Lavoura arroz.* 1956, **10,** No. 111, 127.

A list is given of 26 grass species and one variety found in the irrigated rice-fields of Rio Grande do Sul, Brazil.—E.B.O.

1174 PADWICK, G. W. **Diseases and pests of rice in Japan.** *Outlook on Agric.* 1956, **1,** No. 1, 20–3, bibl. 18.

The chemical control measures used against the main pests and diseases of rice in Japan are outlined.—M.P.

1175† REYES, G. M. **Studies on the control of rice stem rot with special reference development of resistance.** *Philipp. J. Ag* 1954, **19,** No. 1–2, 119–25, bibl. 3, illus.

It is claimed that almost complete control of stem rot (*Leptosphaeria salvinii*) in the Philippi has followed the use of the Raminad Strain variety, a selection from the prolific, high-yield variety Rá-mây and a native variety, Inadhi Raminad Strain 3 has also shown considera resistance to sheath rot (*Sclerotium sphaeroi* and to brown linear spot (*Cercospora oryzae*) P.J.B.

1176 PORTÈRES, R. Historique sur les premi échantillons d'*Oryza glaberrima* St. recue en Afrique. [**History of the first specim of *Oryza glaberrima* collected in Afri** *J. Agric. trop. et Bot. appl.* 1955, **2,** No. 10– 535–7.

1177 PORTÈRES, R. Présence ancienne d' variété cultivée d'*Oryza glaberrima* St. Guyane Française. [**Long existence o cultivated variety of *Oryza glaberrima* French Guiana.**] *J. Agric. trop. et Bot. a* 1955, **2,** No. 12, 680, bibl. 2.

1178 GANGULEE, H. C. **Studies on the date of emergence in rice. 1. Relation betw sowing time and date of ear emergence.** *Gaz.* 1955, **117,** No. 1, 1–10, bibl. 13, il [Presidency Coll., Calcutta, India] [ceived May, 1956]

In a study of the relation between sowing time the date of ear emergence in rice (*Oryza sativa*), Aman and non-Aman varieties were found to fundamentally different in their flowering reacti while the former tend to flower mainly in autumn and rarely in the spring, the latter flo evenly throughout the year when sown at differ dates. It is suggested that all Aman varieties to be regarded as short-day plants, while the ot varieties do not form a homogenous group as their photoperiodic reactions.—Author's summa

1179 MISRA, G. **Photoperiodism in rice. 4. Effe of short day length on three medium-ea varieties of rice of Uttar Pradesh.** *Proc. Inst. Sci. India. B.* 1955, **21,** No. 1, 1 bibl. 17, illus. [Dep. Bot., Ravenshaw C Cuttack]

The effect of 10 hr.-photoperiods on the flower behaviour of 3 medium-early rice varieties studied in pot cultures. Altogether 5 differ types of short-day treatment were given to differ lots of plants in the seed-bed. These included 3 5 and 6 weeks of short-day treatment, and, in fifth lot, treatment continued until ear emerge There was a gradual delay in ear emergence on

nain shoots of plants as the duration of short-day reatment increased in the seed-bed and there-ifter. The short-day treatment for different lurations of 3–6 weeks, respectively, retarded the ormation of tillers, leaves and panicles, but nhanced plant elongation and panicle growth. The number of spikelets and grains per panicle also ncreased. Although the absolute weight of grains emained unaffected, there was a general improve-nent in grain-setting due to short-day treatment. Grain yield was consequently higher than in the ontrols. Short-day treatment prolonged until he usual heading time caused an all round adverse ffect, excepting on the absolute weight of seeds.—Author's summary.

1180 PATRICK, W. H. (Jr.) and STURGIS, M. B. **Concentration and movement of oxygen as related to absorption of ammonium and nitrate nitrogen by rice.** *Soil Sci.* 1955, **19,** No. 1, 59–62, bibl. 10. [Dep. Agron., Louisiana Agric. Exp. Sta., Louisiana State Univ., Baton Rouge]

The value of N, as NH_4^+ and as NO_3^-, to the nutrition of rice, at different levels of O_2 supply o the roots, was studied. Bubbling free O_2 through oil and flood water in pots caused an increase in growth. The presence, and hence action, of O_2 was estricted to within 1 cm. of the soil surface. NH_4^+ was absorbed more and produced a greater growth than NO_3^-. Much of the O_2 supply to the oil surface was utilized in the oxidation of re-luced products from microbial decomposition and vas not available for respiration, but the O_2 in the lood-water layer may have increased the supply vailable to the plant.—J.F.C.

1181 MORI, T. **Studies on ecological characters of rice root. 1. Effect of hydrogen sulphide on root growth of rice plant.** *Rep. Inst. agric. Res., Tôhoku* 1955, **6,** No. 2, 121–36, bibl. 12, illus.

Low production in muck paddy fields has been ttributed to H_2S. Rice was grown in water-ulture to which H_2S was added periodically. H_2S reduced the number of main-stem leaves, etarded heading-date (after prolonged action), lelayed tillering and reduced weight. The genera-ion of new roots was accelerated and then re-arded. The long delay in the reduction of root-rowth was ascribed to indirect action through the hoots. The ratio of weight of roots to their ength was lower because of increased branching nd accelerated tissue death. The root/shoot weight atio was reduced and became very low at heading. The root/stem number ratio was reduced. Young ctive roots were more sensitive to H_2S than older oots. At early heading, lengthening of roots redominated over root-number increase but there vas much destruction of internal tissue. Brown discoloration of roots was due to Fe_2O_3 which was decreased by H_2S, while transparent necrosis increased ; this necrosis was attributed to injurious reductants which may normally be removed by root-secreted O_2. The cause of root-injury seemed to be anaerobic conditions promoted by H_2S.—J.F.C.

1182 OKAJIMA, H. and TAKAGI, S. **Physiological behaviour of hydrogen sulfide in the rice plant. 2. Effect of hydrogen sulfide on the content of nutrients in the rice plant.** *Rep. Inst. agric. Res. Tôhoku, Japan* 1955, **6,** No. 2, 89–99, bibl. 7.

Rice in pots was treated in 5 ways : control, roots on 2 sides treated with H_2S, roots on 1 side treated with H_2S, roots on 1 side cut, and roots on 1 side given no nutrients. Ear yield and the efficiency of absorbed nutrients were reduced. The translocation of inorganic nutrients, and the formation of carbohydrate and its translocation were inhibited. Carbohydrate accumulated in the stems. Soluble N and carbohydrate were somewhat increased as in K-deficient plants, but this was not due to the K-status alone. It was concluded that injury depended on the inhibition of normal metabolism as well as inhibition of nutrient uptake.—J.F.C.

1183 GOTA, Y. and TAI, K. **Studies on oxidizing power of roots of paddy rice plant. 1. On difference among varieties of seedling roots.** [Japanese] *J. Sci. Soil, Tokyo* 1956, **26,** No. 10, 403–4, bibl. 11, English summary. [Shiga Agric. Coll., Japan]

Studies were made on the oxidizing power, using esculin, of the seedling roots of 13 varieties of paddy rice, grown in water cultures. The amount of esculin oxidized over 20 hr. by 1 mg. of root was greatest for Nōrin No. 22 and least for Yubae. Those varieties with a high capacity to oxidize esculin also showed high resistance to "akiochi" conditions.—P.J.B.

1184 WILLS, Pamela, A. and WILSON, Winifred. **The protein content of Australian rice.** *Aust. J. Sci.* 1956, **18,** No. 5, 161–2, bibl. 5. [Aust. Inst. Anatomy, Canberra, A.C.T.]

Samples of brown and white rice of the 1953–4 crop of the variety Caloro 2, grown in the Murrumbidgee and Wakool irrigation areas of N.S.W., had protein contents ranging from 5·7–7·5 (moisture–free basis). These values were lower than those given in some other published records.—M.P.

1185 TIDBURY, G. E. **Response of rice to certain fertilizers in Zanzibar.** *Trop. Agric., Trin.* 1956, **33,** No. 2, 113–26, bibl. 6. [Dep. Agric., Zanzibar]

The response of rice to separate and differently combined applications of 0, 1, 2 and 3 cwt. of sulphate of ammonia and of 0, 1, 2, 3, 4, 5 and

6 cwt. of superphosphate per ac. was studied. The soils were described as *changa* (sandy non-calcareous type), *namo* (heavy clays), and *mtifutifu* (sandy phosphate deficient type), on which the reviewed experiments had been carried out in different localities in Zanzibar since 1949. A study of the interaction between N and P showed three results : (1) The responses to the higher levels of each fertilizer were enhanced when the other fertilizer was also present at a high level. (2) A high level of N was needed if maximum response was to be had from medium and low levels of P and vice versa. (3) The response to a low level of either N or P was enhanced when at least a low level of the other fertilizer was present. The greatest response in terms of extra rice per ac. was obtained when 3 cwt. per ac. each of sulphate of ammonia and superphosphate were applied. When the value of the extra rice and fertilizer cost was considered, the most profitable dressing was 2 cwt. per ac. of sulphate of ammonia plus 3 cwt. per ac. of superphosphate.—P.M.G.

1186 BARLEY, K. P. and HUTTON, J. T. **Effects of a lowland rice crop and of gypsum on a saline alkali clay.** *Aust. J. agric. Res.* 1956, **7,** No. 2, 110–26, bibl. 13. [Reg. Past. Lab., Deniliquin, N.S.W. (K.P.B.) ; Div. Soils, C.S.I.R.O., Adelaide (J.T.H.)]

Lowland rice cropping for one season decreased the soluble salts, particularly the chlorides, in the top 30 in. of the soil. After 2 years' growth of pasture following rice, part of the soluble salts had returned to the top 30 in. of soil. The application of gypsum at 2 and 8 tons per ac. before growing the rice crop increased the Ca : Na ratio of both soluble and exchangeable cations and reduced clay dispersion. Rice seedling establishment and yields of stubble-sown subterranean clover were higher on the gypsum-treated plots.—From authors' summary.

1187 HAYNES, D. W. M. **Further investigations into the use of self-propelled combine harvesters for the harvesting of wet padi in the North Kedah Plain.** *Malay agric. J.* 1955, **38,** No. 4, 237–49, bibl. 4.

[See also *Fld Crop Abstr.* 8 : 464.] Owing to mechanical failures of the combine during the trial in 1954–5, the average cost of combining was about 27% more than hand harvesting. Under average conditions, the cost of combining was generally less than that of hand work.—M.P.

1188 SALMOND, K. F. **Insect infestation in stored rice in Nyasaland.** *Trop. Agric., Trin.* 1956, **33,** No. 2, 134–5, bibl. 4. [Dep. Agric., Nyasaland]

1189 ABRAHAM, T. P. and MOHANTY, G. C. **An experimental investigation on sampling f yield, tillers and height in replicated fie experiments on rice.** *Indian J. agric. S* 1955, **25,** No. 4, 253–64, bibl. 3. [Cer Rice Res. Inst., Cuttack]

GENERAL

1190 WOODWARD, R. W. **The effect of rate a date of seeding of small grains on yield** *Agron. J.* 1956, **48,** No. 4, 160–2. [Ut Agric. Exp. Sta., Logan]

The trials reported were carried out on fertil irrigated land in Utah. Crops used were : Velv and Bonneville barley, Lemhi wheat and Overla oats. Sowing rates in 1952 were 50, 80, 110 a 140 lb. per ac. and 30, 60, 90 and 120 lb. per ac. 1953 and '54. Sowing dates were late April a late May, 1952 and late March, late April and la May, 1953 and '54. Mean yields of Velvon barl were slightly higher at sowing rates of 30 lb. per a than where higher rates were used. With Bonn ville barley and the other crops, sowing rates 50–60 lb. per ac., in most cases, gave the be yields. Where sowing was late, and combined wi the lowest sowing rates, weed infestation a disease incidence tended to be relatively severe.- P.J.B.

1191 DANIEL, G. H. **Dredge corn.** *Agricultu Lond.* 1956, **62,** No. 10, 481–4. [N.I.A. Reg. Trials Cent., Cannington, Somerse England]

Testing of cereal mixtures has shown that crops half-and-half combinations have the advantages increased yield and insurance against loss, e. where disease attacks one of the component Factors, viz. straw lengths and growth period to be considered in choice of mixtures are discusse together with the advisability of including legum under certain conditions.—G.M.W.

1192 DEPARTMENT OF AGRICULTURE, REPUBL OF IRELAND. **Cereal variety trials at t Department's farms, 1953.** *J. Dep. Agr Republ. Ire.* 1954-55, **51,** 98–112. [Receiv July, 1956]

The results of replicated cereal variety trials a given. In the winter-wheat trial, Hybrid 4 Cappelle Desprez and Nord Desprez gave simil yields which were significantly above Glasnev Rosa. The spring-wheat varieties again were n significantly different in yield. Glasnevin Triump was the lowest yielding oat variety, and, wi S84, had a significantly higher percentage of hu than Sun II or Blenda. Of the potato-oat strai on trial at Ballyhaise, Scotch Potato outyield Potato (Ardee), Mass Selection D and Glasnev Potato ; the last variety was disappointing.

he barley trials, Spratt-Archer × Kenia selections produced at the Cereal Station, Ballinacurra) ompared very favourably with Herta, Ymer, Bonus and Carlsberg in yield and quality of grain. Herta was the most resistant to lodging.—M.P.

193 Department of Agriculture, Republic of Ireland. **Field experiments, 1953.** *J. Dep. Agric. Republ. Ire.* 1954–55, **51,** 87–97. [Received July, 1956]

NVESTIGATIONS REPORTED :

. Spring wheat variety trials, pp. 87–9. The verage yields of Progress, Atle, Karn II and Ella vere 28, 27, 27 and 26 cwt. per ac., respectively. Atle was the shortest-strawed ; Karn II was the arliest to mature and, with Ella, tended to lodge nore than the others.

. Oat variety trial, pp. 90–2. The average yields f Triumph and Sun II were similar.

. Barley variety trial, pp. 92–4. Ymer and Herta ielded significantly more than Beorna, which odged more and ripened later than the other two arieties.—M.P.

194 Osborne, L. W. and Smith, H. T. E. **The choice of cereal varieties in Cambridgeshire.** *Agriculture, Lond.* 1956, **62,** No. 10, 475–9, illus. [N.A.A.S. East. Prov.]

195 Aastveit, K. and Strand, E. **Investigations on the respiration rate of small grain seeds of different moisture content and harvested at different stages of maturity.** *Acta agric. scand.* 1954/5, **5,** No. 1, 76–84, bibl. 11. [Roy. Agric. Coll., Vollebekk, Norway]

Grain of Ås II wheat, Sun II oats, Varde 6-rowed barley and Herta 2-rowed barley was harvested at 4 stages of maturity. Stage 2 of maturity was as follows : grain doughy, or waxy, leaves withered, straw yellow, but still slightly green at the nodes. Stages 1, 3 and 4 were 1 week before and 1 and 3 weeks after stage 2, respectively. The respiration rate of the grain was determined by measuring the amount of CO_2 in mg. evolved per kg. of dry matter during 24 hr. The moisture content of seed harvested at stage 1 ranged from 1·9 to 47·3% and from 18·3 to 30·3% at stage 4. The grain of wheat respired most rapidly, followed by oats, 6-rowed barley and 2-rowed barley. There were no significant differences between the rates of respiration of grain harvested at stages 1 and 2. The respiration rate of grain with over 22% moisture content, at stages 1 and 2, increased approximately linearly with increasing moisture content, up to a maximum of about 40%. That of wheat increased most steeply and that of 2-rowed barley the least steeply. For grain with less than 20% moisture, the increase in respiration rate with increasing moisture content was less steep than for 6-rowed barley. Grain harvested at stages 3 and 4 showed varying rates of respiration, the reasons for which were not apparent. Samples harvested at stage 4 had relatively high respiration rates at moisture contents over 22%, which may have been due to the comparatively heavy microflora on the grain surface. Except in the case of 2-rowed barley, the respiration rate of remoistened grain was lower than that of grain not previously dried. The relatively lower rate of respiration in 2-rowed barley compared with 6-rowed barley was thought to be due to the highly dormant charater of the 2-rowed variety (Herta) used.—P.J.B.

1196 Cunningham, D. K. and others. **Preparation and chemical characteristics of the cohesive proteins of wheat, barley, rye, and oats.** *Cereal Chem.* 1955, **32,** No. 2, 91–106, bibl. 11. [Grain Res. Lab., Board of Grain Commissioners for Canada, Winnipeg, Manitoba]

1197† Ekstrand, H. Höstädens och vallgräsens övervintring. Sammanfattning av hittils utförda och program för fortsatta undersökningar. [**Overwintering of winter cereals and forage grasses. Summary of results and programme for continued investigations.**] *Medd. 67. Stat. Växtskyddsanst.* 1955, pp. 125, bibl. 72, illus., Swedish and English summary. [Swedish Pl. Protect. Inst.]

The results of several years' research are reviewed with special reference to the parasitic fungi which are described as the most important cause of winter injury to ground crops. "Winter injury does not coincide with cold injury and winter-hardiness does not equate with cold resistance." It is not always the extremely cold winters that are the most dangerous, but mild winters with deep snow, especially on unfrozen ground, when favourable conditions for fungi are created. Specific and varietal differences in susceptibility to the different fungi are noted. Some conclusions of importance for the farmer, the experimental worker and the plant breeder are presented.—G.M.R.

1198 Church, B. M. and others. **Survey of rabbit damage to winter cereals, 1953–54.** *Pl. Path.* 1956, **5,** No. 2, 66–9. [Rothamsted Agric. Exp. Sta., Harpenden, Herts, England]

In the previous survey during 1951–2 [see *Fld Crop Abstr.* 7 : 381], losses caused to winter cereals by rabbit grazing were estimated at 1·6 cwt. of grain per ac. in south and central England. A similar survey in 1953–4 was carried out in nearly every county in England and Wales. For all fields surveyed (119 of wheat, 18 of oats and 1 of rye), average grain losses caused by rabbit grazing were 1·4 cwt. per ac., or 7% of the average yield. For winter wheat, alone, losses averaged 1·7 cwt. per ac.,

or 8% of the average yield. About 30% of the fields sampled were moderately or severely grazed by rabbits.—P.J.B.

1199 THAKUR, C. and others. **Spring small grain anatomical response to top growth clipping.** *Agron. J.* 1956, **48,** No. 3, 123–6, bibl. 10. [Agron. and Bot. Dep., Univ. Wisconsin, Madison]

Anatomical studies made on field plants of spring cereals showed that stems of plants clipped of their top growth possessed much more closely arranged vascular bundles than did unclipped plants. In all cases the bundles of clipped plants were smaller in diameter than those of unclipped plants. No specific internal structural character of stems was found to be associated with lodging reactions, although well developed larger vascular bundles, surrounded by thick layers of mechanical tissue, appeared to be associated with lower lodging percentages. A temperature of 78°F. wrought similar changes in root structure to those induced by clipping : reductions in (1) stele diameters, (2) number of xylem strands and (3) number of metaxylem vessels as compared with those in roots of plants grown at 61°F., the near-optimal temperature for sustained growth of cereals.—From authors' summary.

1200 AVAKJAN, A. A. [**The biological nature of the so-called interchangeable grain grasses.**] [Russian] *Izv. Akad. Nauk SSSR (Bull. Acad. Sci. USSR Ser. Biol.*) 1956, No. 2, 50–61, illus.

[Interchangeable crops are those which behave either as spring types or winter types, depending on sowing date.] From observations made on spring- and autumn-sowings of different barley varieties, the author confirms that when sown in spring interchangeable grasses resemble spring cereals ; but they may also resemble winter cereals because, when sown in the short days of autumn, they pass to the second phase of development only after subjection to 0–3°C. during a prolonged period (35–45 days). The requirement of these interchangeable types for low temperatures prevents them from passing the light phase when sown in autumn (natural short day) and their winter resistance is thereby enhanced. Thus, interchangeable grasses resemble spring crops in regard to the vernalization phase, but under short day, in contrast to spring crops, the completion of the first developmental phase does not ensure passage to the light stage. For this, prolonged subjection to low temperatures is requisite. However, for interchangeable crops (in contrast to winter grasses) the adverse effect of an unsuitable temperature factor in the complex of conditions necessary for passing the vernalization phase may be mitigated by strengthening the effect of nutrients necessary at this phase, and this may be achieved by growin the plants in long day.—M.H.

1201† COOPER, J. P. **Developmental analysis c populations in the cereals and herbag grasses. 1. Methods and techniques.** *J agric. Sci.* 1956, **47,** Pt. 3, 262–79, bibl. 2 illus. [Welsh Pl. Breed. Sta., Univ. Col Wales, Aberystwyth]

This work presents an analysis of ecologica differences between populations in terms of on important developmental system, the timing c inflorescence development on the shoot apex, an its corollary, the partition of energy between see production and continued vegetative growth. Th object of the first paper is to establish rapid an accurate greenhouse methods for testing respons to low temperature and photoperiod, the mos important environmental factors influencing in florescence development. The following applica tions of the methods are suggested : (i) Th agronomic classification of populations and th prediction of their behaviour under specific loca climate and farming practice. (ii) The rapid selec tion and progeny testing of parent material i plant breeding work. (iii) The assessment of th potential genetic variation within populations an the study of the adaptive changes occurring unde selection. The work was carried out with severa lines of *Triticum* spp., and with *Lolium* spp mainly *L. temulentum.*—From author's summary.

1202 OLSON, R. A. and DREIER, A. F. **Fertilize placement for small grains in relation t crop stand and nutrient efficiency i Nebraska.** *Soil Sci.* 1956, **20,** No. 1, 19–24 bibl. 24. [Dep. Agron., Nebraska Agric Exp. Sta., Lincoln]

Literature on the effect of fertilizers on germinatio is reviewed. The time and method of fertilize application have been found to influence markedl the stand and growth of small grains, and sever losses have been observed due to moderate rate of N and K fertilizers placed with the seed. Th losses were not consistent. Experiment indicate that the most severe losses occurred at a lo moisture-level, and were proportional to the tim between sowing and rain. Damage to germinatio at a critical low soil-moisture level occurred a 10 lb. N/ac. and stand elimination at 160 lb. N/ac It was found that when the soil-water content wa low, the concentration of dissolved fertilize around the seed could increase in time and tha germination could be inhibited by the fertilize even when it was not placed together with th seed. Complete inhibition was effected by CaCN and severe reduction by NH_4OH ; the order o increasing inhibition was found to be : NH_4NO_3 $(NH_4)_2SO_4$, KNO_3, $NaNO_3$, $CO(NH_2)_2$, NH_4OH $CaCN_2$. There was less damage using pellete

aterial. As the efficiency of applied P is usually uch greater when applied with the seed, it was ncluded that this practice should be continued, it that the amount of N so applied should not ceed 15 lb. per ac.; most of the N should be plied separately.—J.F.C.

203† DÖRNER, H. Probleme bei der Feuchtigkeitsbestimmung im Getreide. [**Problems in the determination of moisture in cereals.**] *Saatgutwirtschaft* 1956, **8,** No. 4, 107–8. [Bundesforschungsanstalt für Getreideverarbeitung, Detmold, W. Germany]

etailed instructions are given for carrying out e standard procedure for determining moisture in reals. The method agreed upon as the standard e for interested organizations in Germany is ying the ground grain for 1·5 hr. in a drying en held rigidly at 130°C. This method does not ve the absolute water-content, which is practically impossible to obtain, but it does give reproucible results. [See also next abstract.]—D.B.

204 DÖRNER, H. Probleme bei der Feuchtigkeitsbestimmung im Getreide. [**Problems in the determination of moisture in cereals.**] *Saatgutwirtschaft* 1956, **8,** No. 5, 143–5. [Bundesforschungsanstalt für Getreideverarbeitung, Detmold, W. Germany]

this concluding article [see also Abs. 1203], e requirements of an apparatus for the rapid termination of the moisture content of cereals e given; these include freedom from individual ternal influences and an accuracy to within 0·2% of the standard method. The instruments sted at Detmold are briefly mentioned and their lue assessed. About 90% of the trials exhibited e required accuracy. The main methods conered were those employing the drying of grain hot air or infra-red radiation, and those using ectrical principles. Results indicated that the eater the water content of the cereals being tested, e greater the inaccuracy of the rapid determinaons. No method superseded the standard method. —M.P.

205 MCDONALD, A. N. C. **The farm drying of crops.** [Contained in] *Industr. Heat. Engnr* 1954–5, pp. 39, illus. [N.I.A.E., Silsoe, Beds] [Received March, 1956]

e techniques and equipment adopted in Britain r the farm drying of cereal crops are considered some detail. Descriptions are given of continus-flow grain driers and platform driers for tches of grain on granary floors, in bins, sacks d trays. The methods used for testing farm iers, and samples of the product being dried, e given.—M.P.

1206 BRUEL, W. E. van den and BOLLAERTS, D. Une des principales causes de détérioration des stocks de grains: la pullulation des acariens. [**One of the main causes of deterioration of stocks of grain: infestation with mites.**] *Rev. Agric., Brux.* 1956, **9,** No. 3, 304–15, bibl. 6, illus. [Sta. Ent. État, Gembloux, Belgium]

An account is given of the extent of the damage met with in stored cereals in maritime countries. The trouble can be met by thorough drying of the grain and by fumigation with phosphine, a technique for which is described.—D.B.

1207 SORGER-DOMENIGG, H. and others. **Grain storage studies. 17. Effect of mold growth during temporary exposure of wheat to high moisture contents upon the development of germ damage and other indices of deterioration during subsequent storage.** *Cereal Chem.* 1955, **32,** No. 4, 270–85, bibl. 25, illus. [Inst. Agric., Univ. Minnesota, St. Paul]

1208 CHRISTENSEN, C. M. **Grain storage studies. 18. Mold invasion of wheat stored for sixteen months at moisture contents below 15 percent.** *Cereal Chem.* 1955, **32,** No. 2, 107–16, bibl. 11, illus. [Inst. Agric., Univ. Minnesota, St. Paul]

1209 GOLUBCHUK, M. and others. **Grain storage studies. 19. Influence of mold infestation and temperature on the deterioration of wheat during storage at approximately 12% moisture.** *Cereal Chem.* 1956, **33,** No. 1, 45–52, bibl. 6. [Inst. Agric., Univ. Minnesota, St. Paul]

1210 PETERSON, A. **Grain storage studies. 22. Influence of oxygen and carbon dioxide concentrations on mold growth and grain deterioration.** *Cereal Chem.* 1956, **33,** No. 1, 53–66, bibl. 24, illus. [Inst. Agric., Univ. Minnesota, St. Paul]

1211 BAUER, D. Beitrag zur Frage zweckmässiger Getreideerntemethoden. [**A contribution to the problem of suitable methods for harvesting cereals.**] *Bayer. landw. Jahrb.* 1955, **32,** No. 6, 381–402, illus. [Inst. Wirtschaftslehre des Landbaues, Weihenstephan, Bavaria]

An analysis has been made of the labour and power required for different methods of harvesting winter wheat and spring barley. At present, mechanized methods are more costly than those requiring labour, but wage trends indicate a reversal of this balance.—D.B.

LEGUMES

SOYABEANS

1212 COLLINS, F. I. and CARTTER, J. L. **Variability in chemical composition of seed from different portions of the soybean plant.** *Agron. J.* 1956, **48,** No. 5, 216–19, bibl. 5. [U.S. Reg. Soybean Lab., Urbana, Illinois]

In trials with 5 soyabean varieties in Illinois, the oil content of the seed varied according to : (a) position of pod on plant, (b) position of pod on raceme, and (c) position of seed in pod. In studies on (a), plants from a thickly-sown, rod-row of Lincoln soyabeans were used. Seed from the top half of the plants contained an average of 21·5% oil and 37% protein ; and 22% oil and 36% protein for seed from the bottom half of the plants. In further studies, seed of indeterminate soyabean types, such as Earlyana and Lincoln, tended to produce seed with the highest oil content in pods on the lower portion of the plants. Determinate types, such as Hawkeye, showed a relatively narrower range of seed-oil contents between the upper and lower portions of the plants than in the indeterminate types. In studies on the effect of position of pod on the terminal raceme on oil content, seed from pods at the terminal 1 or 2 nodes contained about 2% less oil than the mean oil content of all seed on the plant, and seed from pods at the middle nodes contained about 1% more oil than the mean. There was little difference in seed-oil content between pods taken from individual nodes on the same raceme. Seed in the tips of pods tended to contain the most oil and the least protein. The effect on oil content of the position of the seed on the plant was much greater than the effect of position in the pod.—P.J.B.

1213 MEGGITT, W. F. and others. **Factors affecting the herbicidal action of aqueous sprays of salts of 4,6 dinitro-ortho-secondary butyl phenol [DNBP].** *Weeds* 1956, **4,** No. 2, 131–8, bibl. 16. [Pl. Industr. Sta., Beltsville, Maryland]

The influence of light and temperature, before, during and after treatment, on the effect of DNBP salts on soyabeans in a greenhouse was studied. Variation in rate (0·5–2 lb./ac.) did not affect the general action of the factors. The results were measured as weight and height and as an injury-rating on a subjective 10-point scale. All these criteria gave similar results. The activity of DNBP increased as the temperature after treatment was raised. Activity was less under prior temperatures of 60° and 90°F. than of 70° and 80°F. Light following treatment reduced the action, whereas light, before treatment, had no effect. Plants grown under weak light were injured more than those grown under stronger light.—J.F.C.

1214 SLIFE, F. W. **The effect of 2,4-D and sever other herbicides on weeds and soybea when applied as post-emergence spray** *Weeds* 1956, **4,** No. 1, 61–8, bibl. 6, illu [Agron. Fm, Urbana, Illinois]

Earlier herbicidal work on soyabeans is reviewe Rates of ·0625 to ·5 lb. 2,4-D (amine) per acre we used at various stages in the growth of soyabea and of 7 commonly associated weed species. Th soyabeans were found to be more tolerant in th early stages, whereas the weeds were more tolera in the later stages. There were no advantages using 2,4,5-T, MCPA, 3,4-D or 4 Chloro instead 2,4-D.—J.F.C.

1215 SUN, C. N. **Histological changes induced soybean roots by 2,4-dichlorophenox acetic acid.** *Science* 1956, **123,** No. 320 1129–30, bibl. 2. [St. Louis Univ., Missouri]

Histological changes in the primary roots soyabeans, induced by treatment with 2,4-D, a described. The effect of 2,4-D was to cause marked stimulation of cells, particularly withi the stele and inner cortex, to a high level meristematic activity.—P.J.B.

GROUNDNUTS

1216 D'EMMEREZ DE CHARMOY, A. La culture d l'arachide. [**Groundnut growing.**] *Rev. agri Maurice* 1956, **35,** No. 1, 31–5.

Advice is given on growing groundnuts in Mauritiu where conditions are favourable for extending th cultivation of this crop. The best variety is Nata Common and the best sowing period is Novembe January.—E.B.O.

1217 OSSEWAARDE, J. G. **The C.G.O.T. ground nut scheme in French West Africa.** *Trop Agric., Trin.* 1956, **33,** No. 2, 86–94, illus.

The activities and results of the Companie Général des Oléagineux Tropicaux, whose aim is the pro duction of fats and oils within the French Union are described. A fully mechanized project in th Casamance area of Senegal for the settlement of 7 families is described.—P.M.G.

1218 SMITH, B. W. ***Arachis hypogaea.* Em bryogeny and the effect of peg elongatio upon embryo and endosperm growth.** *Amer J. Bot.* 1956, **43,** No. 3, 233–40, bibl. 15 illus. [North Carolina State Coll., Raleigh

Though normal meiosis and double fertilizatio occur in 90–95% of ovules, less than 15% of fruit and seeds survive to maturity. To determine th nature and frequency of seed failures which occu in the early, and aerial, stages of fruit developmen the development of the embryo and endosperm was traced from syngamy to the beginning of po

nlargement 3 weeks later. " After 4 or 5 division ycles there is a period in the development of both mbryo and endosperm during which few mitoses ccur. This lasts from approximately the 5th to ie 10th day of seed development and corresponds ith the period of maximum growth rate in the eotropic peg. The endosperm develops more apidly than the embryo, and both structures grow iore rapidly in the basal than in the apical seed. significantly higher frequency of fertilization ailure and of early embryo abortion occurs in the pical position. The frequency of seed failure from oth causes corresponds closely with the frequency f one-seeded fruits encountered at harvest. The itercalary meristem responsible for peg develop- ient lies across the vascular system just below ie seeds and proximal to their initial source f nutrients and water. The developmental ad- antage of the basal seed and the frequent early portions of the apical seed are interpreted as ffects of the competition resulting from this type f arrangement."—D.B.

219 PORTÈRES, R. Variations dans la symètrie du calice de l'arachide (*Arachis hypogaea* L.). [**Variations in the symmetry of the calyx of groundnuts** (***Arachis hypogaea L.***).] *J. Agric. trop. et Bot. appl.* 1955, **2,** No. 7-9, 436–7, illus.

220 OLLAGNIER, M. and PREVOT, P. Comparaison du diagnostic foliaire et de l'analyse des sols pour la détermination des besoins en engrais de l'arachide. [**Comparison of foliar diagnosis and soil analysis for determining the fertilizer requirements of groundnuts.**] *Oléagineux* 1956, **11,** No. 6, 395–400, bibl. 14. t is concluded that the mineral requirements of ie plant are better determined by foliar diagnosis ian by soil analysis.—From authors' conclusion.

221 FERRAND, M. Fumure équilibrée et alimentation équilibrée des cultures. [**Balanced manuring and balanced nutrition of crops.**] *Oléagineux* 1956, **11,** No. 7, 437–44, bibl. 9. s a result of research during the last 20 years, the oncept of balanced NPK manuring has been placed by the wider concept of balanced nutri- on. This varies with different crops and different tuations and can be controlled by foliar diagnosis. his method, in particular, allows the influence of imate on the degree of absorption of mineral ements by the plant to be studied. For ground- uts, the value of the N/P ratio, which is normally 5–17, is more important than the absolute iantities of N and P in the leaves. For instance, cording to situation, the nutrition of groundnuts well balanced with N = 4·2 and P = 0·25 or = 3·3 and P = 0·2.—E.B.O.

1222 SAG, G. Influence de l'aluminium sur le développement de l'arachide. [**Influence of aluminium on groundnut development.**] *Oléagineux* 1956, **11,** No. 5, 315–22, bibl. 25, illus.

With a view to using aluminium phosphate, deposits of which are found in Senegal, for manuring groundnuts, laboratory investigations were carried out to study the effect of Al on groundnut plants. Results from 2 series of trials, in which groundnuts were grown in sand, without a nutritive solution, showed that concentrations of Al of about 20–40 mg./l. of water did not reduce the vegetative development of plants grown with sufficient light but that concentrations of Al as low as 8 mg./l. caused a decrease in the dry weight of plants grown with insufficient light. Results from 2 other series of trials, in which groundnut plants were grown with nutritive solutions, indicated that aluminium sulphate increased the vegetative development and weight of the plants, the maximum effect corresponding to a dose of 40 mg. of Al per l. It is concluded that aluminium phosphate can be used with safety for manuring groundnuts.—E.B.O.

1223 MATHUR, P. B. and others. **Studies in the cold storage of peanuts.** *J. Sci. Fd Agric.* 1956, **7,** No. 5, 354–60, bibl. 15, illus. [Cent. Fd Technol. Res. Inst., Mysore, India]

Shelled and unshelled groundnuts, packed in small gunny bags, were stored at 4 temperature ranges from 32° to 92°F. for 9 months, at relative humidities ranging between 85 and 90% in the cold-storage chambers and 50–82% at room temperature. A parallelism was observed between the changes during storage in the moisture contents of the kernels and the acid values of the extracted oils and, to a lesser degree, the changes in peroxide values. With regard to germination capacity, shelled nuts should be stored at 32–35°F. and unshelled nuts at room temperatures (71–92°F.). A free-fatty-acid content exceeding 1% was found to be associated with seeds of low germination capacity. Neither the shelled nor the unshelled condition, nor the storage temperature, had any effect on the early growth of viable seeds. After 9 months at 32–35°F. both shelled and unshelled seeds were 100% marketable. A temperature of 32–35°F. and a R.H. of 85–90% are recommended as the optimum conditions for the cold storage of groundnuts.—From authors' summary.

PEAS

1224 OWERS, A. C. and YULE, A. H. **Preliminary experiments on the drying pea crop.** *Exp. Husb.* 1956, No. 1, 58–62, bibl. 3. [Terring-

ton St. Clement Exp. Husb. Fm, nr. King's Lynn, Norfolk]

Varietal trials. The "blue" varieties Rondo, Unica and Servo yielded consistently well and outyielded Zelka (Harrison's Glory) (a marrowfat) by at least 26%. However, Zelka is preferred by the driers for its quality and commands a high price. Emigrant, also a marrowfat pea, is more reliable than Zelka in a season unfavourable to peas. Seed rate. Three seed rates, 8, 12 and 16 stones per acre, were tested. Taking the 3-yr. average, 12 st./acre gave a yield increase of 12% over 8 st./acre, and 16 st./acre gave a further 6% yield increase. The results support the continuance of the present practice of sowing 15–16 st./acre.—D.B.

1225 Seay, W. A. and West, S. H. **The effect of seed treatment on yield and germination of garden peas.** *Soil Sci.* 1956, **20,** No. 2, 198–200, bibl. 6. [Agron. Dep., Univ. Kentucky]

In the past, satisfactory nodulation was not obtained when Rhizobium and seed protectants were used together, but satisfactory nodulation occurred when Rhizobium was already present in the soil. The effect of treatment with Spergon (tetrachloroparabenzoquinone) and of Rhizobium inoculation on the yield and germination of 5 varieties of garden peas was studied. Germination was carried out in the field and in the laboratory at 40, 45 and 50°F. The trend toward increased yield due to each treatment, separately or together, was not significant. Spergon increased germination while Rhizobium inoculation did not. As the soil evidently contained the correct Rhizobia, the question of compatability of protection and inoculation was not answered.—J.F.C.

1226 Heintze, S. G. **The effects of various soil treatments on the occurrence of marsh spot in peas and on manganese uptake and yield of oats and timothy.** *Plant and Soil* 1956, **7,** No. 3, 218–35, bibl. 24, illus. [Rothamsted Exp. Sta. Harpenden, Herts]

Marsh spot of peas was used as an indicator in experiments concerning the effects on Mn availability of Zn and Mo. Both elements increased the disease where Mn was deficient but had no effect when it was sufficient. Besides suppressing Mn uptake, Mo probably has a direct metabolic effect; its catalytic action may explain the increased amino-acid contents of plants. Grey speck of oats was used as an indicator in experiments on the action of various manganese compounds, steam and formalin on yield and Mn content. All the oats, grown in Mn-deficient soil, had the disease, no treatments controlling it; grain- and leaf-yields increased, husk- and stem-yields being depressed. Signs of Mn deficiency in oats were not necessarily a guide to the need for further Mn application.—J.F.C.

1227 Lubatti, O. F. and Blackith, R. E. **Fumigation of agricultural products. 14. Treatment of peas and beans with methyl bromid** *J. Sci. Fd Agric.* 1956, **7,** No. 5, 343–8, bib 7. [Imp. Coll. Fld Sta., Sunninghill, Berks

Peas and beans are notably resistant to damage b methyl bromide fumigation, and may be safel treated even when the seeds contain as much a 19% water. The damage done by fumigation substantially independent of the moisture conte of the seed. Treated seeds gave yields similar t those from untreated seeds. Attempts to rela the results of germination tests in sand to viabilit tests with tetrazolium salt have proved difficul although damage to the seeds could be detected b this method.—From authors' summary.

1228 Home Grown Threshed Peas Joint Committee. Great Britain. **Report for 195** 1956, pp. 54, bibl. in text, illus.

Investigations reported:

1. Date of sowing, pp. 21–5. Highest yields we again obtained from sowings carried out before mi March, where soil conditions were suitable.

2. Inoculation of peas, pp. 26–7. Results experiments at 3 centres indicate that, except i rare cases, inoculation of peas is unlikely to b beneficial on soils in the localities concerned.

3. Wild oat eradication, pp. 27–31. [See *Fl Crop Abstr.* 8 : 898.]

4. Comparison of dinitro compounds for control weeds in peas, pp. 33–9. The ammonium, sodiu and triethanolamine salts of Dinoseb and DNOIP were applied at 0·9, 1·5 and 2·5 a.e. per ac. in 1 and 60 gal. per ac. Dinoseb was slightly superior t DNOIPP. Low-volume spraying generally gav a better weed kill than high-volume sprayin Triethanolamine Dinoseb is most promising, and i preferable to the ammonium salt if temperature are high at spraying, since the latter herbicide tend to cause severe scorch and to reduce yields unde these conditions. Where wide row-spacing pe mitted inter-row hoeing, weed control, in terms yield, was as effective as the best chemical treat ment.

5. The effect of harvesting methods on texture peas. (a) Artificial drying, pp. 45-7. [See *Fld Cro Abstr.* 8 : 903.] (b) Four-poling versus windrowin pp. 47–8. Results of analyses showed a trend i favour of four-poling. The variety Servo was mor weather-resistant than Zelka. The method of treat ment of the crop after cutting had no influence o texture. (c) Pre-harvest drying p. 51. The desic cant MCA, applied at 8 and 16 lb. active ingredien in 60 gal. per ac., appreciably reduced the moistur content. When applied prematurely, however yields were depressed, whereas when the applica tion was delayed the moisture content was no reduced sufficiently or rapidly enough.—M.P.

BEANS

1229 WILTSE, M. G. **Chemical defoliation of Michigan field beans.** *Down to Earth* 1956, **11,** No. 4, 12–13, bibl. 3, illus. [Dow Chem. Co.]

As weather conditions normally do not allow good drying of beans, a reduction in moisture content by chemical means was sought. Magron, having 40% $Mg(ClO_3)_2$ was compared with equivalent $NaClO_3$–$NaBO_2$ mixture, and applied at 1–4 qt./ac. by air and by ground equipment. Magron was equal or superior in causing defoliation and desiccation of immature leaves and weeds. The best results ensued from applying Magron, 1 week before normal pulling-time at 2 qt./4–6 gal. water, by aeroplane ; defoliation of beans having <85% yellow leaves required 3–4 qt. Addition of the wetting agent Dynawet at 2 oz./ac. increased desiccation and prevented regrowth. Usually the beans were harvested 4–14 days after defoliation. The treatment allows earlier harvesting, less windrow-drying and a reduction in rain- and storage-spoilage.—J.F.C.

1230† GOODCHILD, D. J. **Relationships of legume viruses in Australia. 1. Strains of bean yellow mosaic virus and pea mosaic virus. 2. Serological relationships of bean yellow mosaic virus and pea mosaic virus.** *Aust. J. biol. Sci.* 1956, **9,** No. 2, 213–37, bibl. 49, illus. [Fac. Agric., Univ. Sydney, N.S.W.]

The physical properties and host ranges of these virus strains are reported. They are of slight economic significance in crop plants, but could be important in pasture legumes, particularly in *Trifolium subterraneum*. Tests indicate that the strains are of one and the same virus.—M.P.

1231 NADA, I. A. A. and RAFAAT, A. **Growth and carbohydrate changes during formation of *Vicia faba* seeds and fruits.** *Indian J. agric. Sci.* 1955, **25,** No. 4, 281–92, bibl. 10. [Dep. Agric. Bot., Fac. Agric., Cairo Univ., Egypt]

1232† BERTHÉLEM, P. Observations préliminaires sur les effets du froid sur la féverole (hivers 1953–54 et 1954–55). [**Preliminary observations on the effect of cold on the field bean (winters 1953-4 and 1954-5).**] *Ann. Inst. nat. Rech. agron., Paris. Sér. B. Ann. Amélior. Pl.* 1955, **5,** No. 4, 615–31, illus. [École Nat. Agric., Rennes]

With the final object of producing winter-hardy varieties, the effect of the cold winters of 1953–4 and 1954–5 on native and foreign varieties of *V. faba* was studied. Of the French varieties, Côte d'Or was the only one which satisfactorily survived the cold and could be recommended for cultivation generally in France. Other varieties were suitable only for regions having mild winters. English varieties were promising, not only because they survived the winter with little injury but also they are larger-seeded than Côte d'Or. The degree of injury to the several aerial and underground organs was assessed on a scale of 0 to 10 (0= unaffected, 10=death). Older leaves suffered more than young leaves and the main stem more than lateral branches. With Côte d'Or there was a localized area of extreme sensitivity in the **2–3 cm.** of main root below the insertion of the cotyledons. The region of greatest resistance was at the base of the stem, in the epicotyl, and in the axil of the 2 cotyledons. These regions of resistance provided means of recovery from frost damage. In Côte d'Or, very young plants recovered by the formation of 2–3 adventitious roots of equal importance which replaced the main tap root which had been killed, and by the formation of new buds in the axil of the cotyledon.—D.B.

1233 BHARDWAJ, S. N. and RAO, I. M. **Studies on the effect of chloride and sulphate of sodium on germination, growth and maturity of gram.** Suppl. *J. Res., Agra* 1955, **4,** 767–75, bibl. 17. [Bot. Dep., Agra Coll., Agra, India]

Seed of gram [*Phaseolus radiatus*] was grown in soil in pots. NaCl and Na_2SO_4, in amounts of 0·05% and 0·1% of the weight of air-dry soil, were added to the soil immediately before sowing. During the 8th to the 12th week of growth, the moisture content of the soil in one series of pots was reduced to the permanent wilting point 4 times, while the other series received optimum moisture supplies during this period. No treatment affected seed germination. At maturity, the shoot dry weight of plants receiving optimum moisture supplies was reduced by 17·4 and 6·9% where 0·05 and 0·1% NaCl concentrations were used, and by 34·6 and 48·4% where 0·05 and 0·1% concentrations of Na_2SO_4 were used, respectively. Where the plants were subjected to drought treatments, the same concentrations of NaCl reduced mean shoot dry weights by 50·5 and 64% and by 42·6 and 44·4%, respectively, where Na_2SO_4 was used. The drought treatments, alone, reduced mean shoot dry weights by 31·7%. Na_2SO_4 had a more severe effect on gram yields than NaCl, under optimum conditions of moisture ; where plants were subjected to drought treatments, no grain yields were recorded.—P.J.B.

LUPINS

1234† SUNDERLAND, N. and BROWN, R. **Distribution of growth in the apical region of the shoot of *Lupinus albus*.** *J. exp. Bot.* 1956,

7, No. 19, 127–45, bibl. 6, illus. [Dep. Agric., Oxford]

1235 Vömel, A. Wachstumsverlauf, Entwicklung und Kornertragsbildung der Weissen Süsslupine (*Lupinus albus* L.) in Abhängigkeit von klimatischen Faktoren. [**The course of growth of the white lupin (*Lupinus albus L.*), its development and seed yield in relation to climatic factors.**] *Z. PflZücht.* 1955, **35,** No. 2, 199–238, bibl. 50, illus. [Justus-Liebig-Hochschule, Giessen, W. Germany]

The modifications induced by climatic factors have been studied in white lupin (Pflug's Gela) for 6 years. The results have been treated statistically and the complicated interactions have been summarized diagrammatically. Factors inducing a high rate of growth (0·7 to 0·9 cm. per day) in the young plant were particularly favourable to a high seed yield. The height of growth of the first whorl at the beginning of flowering and, in later stages, the number of pods were also indications of seed yield. Low-temperature treatment (1 to 2°C.) of seed and seedlings was not favourable to seed yield, but a less vigorous treatment of 3 to 10°C. for a short period was favourable. Sowing in the first half of April is recommended for Western Germany.—D.B.

1236 † Hackbarth, J. Die ökologischen Ansprüche der Lupinenarten. I. Anbau zur Körnergewinnung. [**The ecological requirements of lupin species. 1. Cultivation for seed production.**] *Z. Pflzücht.* 1955, **35,** No. 2, 149–78, bibl. 9, illus. [Max–Planck–Inst. Züchtungsforschung, Zweigstelle Scharnhorst, W. Germany]

This study was undertaken to find out the ecological conditions favourable to the growth of *Lupinus luteus, L. angustifolius* and *L. albus,* and the regions of W. Germany most suited to these species. The study was limited to the cultivation of lupin for seed production, and observations were made on areas which form a cross-section of conditions in W. Germany. Date of sowing determines day-length and temperature, both of which have a marked influence on seed germination and growth of the seedling, and therefore on the future crop. For each area there were two sowing dates at an interval of 14 days. On the basis of observations, it is recommended that *L. luteus* and *L. angustifolius* should be sown at the earlier date, and the short form of *L. albus* at the later date. For seed production, light soils are suited to *L. luteus,* but better soils are required for *L. albus* and the small-leaved *L. angustifolius.* So far as soils are concerned, the yellow sweet lupin can be grown all over Western Germany, but it is most at home in Northern Bavaria. The small-leaved blue lupin is limited to regions in which there is no danger of drought in early summer; it grows best in northern Germany. The white lupin cannot be grown in regions with a short growing period, a heavy rainfall or a high water-table. In Western Germany its northerly limit is the northern boundary of the Lüneburg Heath. All three species flourish in the region between the Lüneburg Heath and the Emms basin, and this is the main region for seed multiplication.—D.B.

ROOTS

SUGAR-BEET

1237 Davis, J. F. **The production of sugar beets on organic soils.** *Bett. Crops* 1955, **39,** 6–10, 47–8, bibl. 6, illus. [Soil Sci. Dep., Michigan Sta. Coll., East Lansing]

Production on organic soils could be materially expanded. The following aspects are discussed: water-control, wind-erosion, time of sowing, sugar-yield, black-root disease (*Aphanomyces* sp.), varietal differences, plant spacing, fertilizer placement, tissue-tests, liming and the application of minor elements and salt. Ideally, sugar-beet requires a 24 in. water-table initially, and 30–36 in. later. Sowing should be as early as possible, and plant density 20–30 thousand per ac. High applications of K are needed; a graph is given showing response to K and P applications. Fertilizers are best applied as a band 2 in. below the seed.—J.F.C.

1238 Steyvoort, L. van. Dégâts de gel sur plantules de betterave en 1955. [**Frost damage to [sugar-] beet seedlings in 1955.**] *Publ. tech. Inst. belge Amélior. Better.* 1955, **23,** No. 4, 243–58. [Inst. Belge Amélior. Better., Tirlemont, Belgium]

Sugar-beet seedlings were damaged by frost early in May, 1955, in Belgium. The damage was confined to the above-ground parts. Recovery took place by growth from the terminal bud. The climatic factors and cultivation techniques which contributed to the severity of the injury were examined and, as a result, certain measures were recommended to prevent a repetition of the damage. These measures are: early sowing with high-quality seed; careful (not excessive) rolling immediately after sowing; improving the physical structure of the soil (by green manuring and liming) which in turn improves the spring temperature of the soil.—D.B.

1239 Fischer, H. Möglichkeiten der Ertragssteigerung bei Rübensamen. [**Possibilities for increasing yield of [sugar-] beet seed.**] *Dtsch. Landw.* 1956, **7,** No. 6, 277–8, illus. [Inst. Acker- u. Pflbau, Friedrich-Schiller-Univ., Jena, E. Germany]

Factors influencing yield of sugar-beet seed were examined. The most important factor was the date of planting out the stecklings. Of the dates tested, the earliest (end March) gave the highest seed yield. Compared with this, late planting (mid-May) resulted in a 26% fall in seed yield and planting in mid-April, which, it is stated, cannot be regarded as late by the standards of agricultural practice in Germany, resulted in a 17% loss of seed. The planting distance had but a slight effect. At 60 × 60 cm. (the usual distance) seed yields were 6% lower than when stecklings were planted at 60 × 50 cm. or 60 × 40 cm. Large stecklings weighing 120–180 g. gave a 17% higher seed yield than small stecklings weighing 20–40 g. The normal-sized stecklings, 40–80 g., gave a 10% lower seed yield than stecklings of 120–180 g. Experiments are in progress concerning time of year for sowing the seed.—D.B.

1240 THOMPSON, E. G. **Trials of commercial strains of sugar beet.** *Brit. Sug. Beet Rev.* 1956, **24,** No. 4, 165–7. [N.I.A.B., Cambridge]

The results of sugar-beet trials in Great Britain during 1955 are tabulated. During the year bolting was high ; the yield of tops per ac. was lower, and of roots and sugar higher, than in 1954. Webb's No. 2 gave the highest calculated yield of sugar per ac., closely followed by Hilleshog N and Bush N (the latter strain in its first year of trial), but Klein E (Sharpe's) and Klein E (German) led the yield average for 1953–5. Bush N also had the lowest percentage of bolters, with 2·6%, followed by Bush E, with 3·5%.—M.P.

1241 WAUTHY, R. and ROUSSEL, N. Les résultats des essais comparatifs de variétés de betterave sucrière en Belgique de 1951–5. [**Results of comparative variety trials of sugar-beet in Belgium from 1951-5.**] *Publ. tech. Inst. belge Amélior. Better.* 1955, **23,** No. 4, 229-42 [Inst. Amélior. Better., Tirlemont, Belgium]

Tests on a range of 27 to 44 sugar-beet varieties in 3 locations in Belgium were continued and the results tabulated for the 5 years 1951–5. [See also *Fld Crop Abstr.* 7 : 891 and 8 : 1307.] Results were similar in all 3 locations. In 1955, there was a difference of 25% in the sugar yield of the best and the worst varieties. The validity of the trials was tested by introducing "doubles" of 6 varieties in each location. Since, in 69 cases out of 72, the difference between a variety and its double was less than the least significant difference, the trials were considered to be very reliable.—D.B.

1242 ZANINI, E. and BALLATORE, G. P. Prove di confronto di *cultivar* di barbabietola da zucchero a semina autunnale in Sicilia. [**Trials to compare autumn-sown varieties of sugar-beet in Sicily.**] *Ric. sci.* 1956, **26,** No. 5, 1511–24, bibl. 1, illus., English, French and German summaries. [Ist. Agron. Gen., Univ. Palermo]

In trials carried out in 2 localities in Sicily, Ricalcata near Trapani (clay soil) and Orléans near Palermo (calcareous, permeable, red soil), in 1954–5, the sugar-beet varieties Dippe E and Kleinwanzleben E, which were best in previous trials, were compared in non-irrigated cultivation with the recently introduced varieties Kleinwanzleben AA and Pedigree E. The main results were : (a) all the varieties tested had a low percentage of bolting, but Kleinwanzleben AA was particularly resistant ; (b) in clay soil, all the varieties, Kleinwanzleben E excepted, yielded more sugar when they were lifted on 14 July than when lifted on 30 June ; this increase was due mainly to a higher root yield, and to a small extent only to a higher sugar percentage in the roots ; (c) on red soil the root yields were lower when harvest took place on 20 June than when it took place on 11 June ; these reductions were not compensated by small increases in sugar percentage ; (d) for the same harvest date, the percentage of sugar in the roots at harvest did not vary greatly among varieties ; for harvest on 14 July, which gave the highest yields, the percentage of sugar in the root pulp varied from 20·3 for Pedigree E to 20·8 in Kleinwanzleben E ; (e) Pedigree E yielded best in both localities, followed by Kleinwanzleben E, Dippe E and Kleinwanzleben AA ; on clay soil, Pedigree E, lifted on 14 July, yielded 35,170 kg. of roots, 8067 kg. of tops and 7140 kg. of sugar, per ha. It was confirmed that sugar-beet grown without irrigation during autumn-spring in Sicily gives satisfactory results on clay-soils, while on calcareous, permeable, red soils it requires some irrigation to give good results.—E.B.O.

1243 COITEUX, F. Les herbicides et le contrôle des mauvaises herbes dans nos cultures de betterave à sucre. [**Herbicides and the control of weeds in our sugar-beet crops.**] *Rep. Quebec Soc. Pl. Prot.* 1954, No. 36, 70–3, illus. [Domn Agric. Exp. Sta., L'Assomption, Quebec]

The results are given of weed control trials in Quebec during 1953, in which pre-emergence treatments with 5, 8, 10, 12 or 15 lb. TCA, or 1, 2, 3, 4, or 5 lb. CMU per ac. were applied to sugar-beet. Treatment with 2 lb. CMU per ac. resulted in almost complete control of weeds and a yield of 16·5 tons of sugar-beet roots per ac., compared with 5·9 tons for controls. Treatment with 12 lb. TCA per ac. resulted in almost as good weed control as 2 lb. CMU and a root yield of 10·3 tons per ac.—P.J.B.

1244 ALLEY, H. P. and BOHMONT, D. W. **Dalapon for control of weeds in sugar beets.** *Down to Earth* 1956, **11,** No. 4, 10–11, illus. [Wyoming Agric. Exp. Sta.]

Grasses were sown with the beet to ensure a good weed-stand. Dalapon was applied at 3–20 lb./ac. in 40 gal. of water, in each of 3 years. Weed control was measured by stand count × average height. Results from post-emergence treatment were better than from pre-emergence treatment. Six lb. per acre controlled two-thirds of the grass and one-third of the broad-leaved weeds, without damage to the stand, the yield or the sugar content. Dalapon was more toxic at 70°F. and over, than at 60°F. and under.—J.F.C.

1245 DONÀ dalle ROSE, A. Lotta anticercosporica ed azione fisiologica del rame. [**Control of *Cercospora beticola* and the physiological effect of copper.**] *Agricoltura d. Venezie* 1956, **10,** No. 3, 137–43, bibl. in text.

In Italy about 20,000 ha. under sugar-beet were treated in 1955 with copper preparations for the control of *Cercospora beticola* ; it was calculated that this treatment increased the sugar yields in the treated areas by 15–20%, on an average. The preparations used were copper oxychloride and Bordeaux mixture, about 2 kg. of copper being applied per ha. in each treatment. It is thought that the increases in yield obtained were due not only to the fungicidal action of copper but also to its favourable effect on the physiology of the plants. —E.B.O.

1246 SCHLÖSSER, L. A. and others. Über die Wirtsunkräuter des Rübengelbsuchtvirus (*Corium betae*). [**Weed hosts of the virus of beet yellows (*Corium betae*).**] *NachrBl. dtsch. PflschDienst, Stuttgart* 1955, **7,** No. 4, 59–60, bibl. 2. [Forschungsinst. Kleinwanzlebener Saatzucht AG., Einbeck ; and Inst. Pflpath. u. Pflschutz, Univ. Göttingen, W. Germany]

21 weed species were tested for their ability to act as hosts of the virus disease yellows in sugar-beet. In addition to members of the Chenopodiaceae and Amarantaceae, the following weeds of beet fields acted as hosts for this virus : *Papaver rhoeas, Capsella bursa-pastoris, Thlaspi arvense* and *Senecio vulgaris*.—D.B.

1247 ERNOULD, L. Résultats obtenus dans la lutte contre la jaunisse de la betterave, en Belgique, par traitements aux insecticides systémiques. [**Results obtained, in Belgium, in controlling beet yellows by treatment with systemic insecticides.**] *Publ. tech. Inst. belge Amélior. Better.* 1955, **23,** No. 3, 147–223, French, Flemish and English summaries. [Inst. Amélior. Tirlemont, Belgium] [Received April, 1956]

In 18 field trials carried out during the years 1950– in 3 sugar-beet growing areas in Belgium, th aphid (*Myzus persicae*) on sugar-beet plants wa almost completely destroyed by spraying wit 0·5 kg./ha. of Systox, Bayer 4632 or 4633 ; or wit 1 kg./ha. of Metasystox. A second treatmen about a fortnight later, reduces the chances of r infestation. After 2 treatments, the number plants showing symptoms of virus disease wa about halved and the disease slight. Compared wit non-treated plants and those treated with no systemic insecticides, there was an increase in yiel of tops and roots and in sugar content, the greate increase being in root yield. The treatmen does not pay unless there is an increase of 7·5% i the yield of sugar. When the attack is light it difficult to forecast the economic value of th treatment. When the attack is heavy (more tha 80% of plants diseased by mid-September) th first spraying should be carried out when there is a average of 0·5 *Myzus persicae* per plant.—D.B.

1248 SNYDER, F. W. **Effect of quantity mineral nutrients on germination and seed ling growth of sugar beets.** *Proc. Amer. So Sug. Beet. Technol.* 1954, **8,** Pt. 2, 340–3 [Michigan Agric. Exp. Sta., East Lansing]

In trials in which sugar-beet seed was sown in san in pots, there was evidence of very low seed reserve of nutrients, as indicated by the superior growt of those seedlings supplied with nutrient solutions compared with those supplied with tap wate In further trials, seed was supplied with quarter- half-, or full-strength nutrient solutions, or ta water. The percentage emergence of seed-balls ove a 7-day period was 60, 70, 65 and 50, respectively an average increase in emergence of 8·4% wher nutrient solutions were provided. Comparison were made of the seedling emergence of 5 varietie of sugar-beet, where the seed was provided wit either nutrient solutions or tap water. There wer marked differences between varieties in rate o emergence and seedling development. It was con sidered desirable to select for a high rate of emer gence and seedling development as a means o increasing yields. Low levels of soil nutrients wer thought to be related to poor stands and slow seedling growth, particularly in certain varieties.— P.J.B.

1249† BIGHI, C. and MANTOVANI, G. Sul dosamento di Cu, Mn, B, Zn, Mo, contenuti nei semi e nelle corrispondenti radici di alcune varietà di barbabietole. [**The determination of the Cu, Mn, B, Zn and Mo contents in the seeds and the corresponding roots of some sugar-beet varieties.**] *Industr. saccar. ital.* 1955, **48,** No. 11–12, 335–9, bibl. 23. [Lab. Chim.- Agr., Univ. Ferrara]

Colorimetric determinations were made of the Cu

Mn, B, Zn and Mo contents in the seeds of 5 varieties of sugar-beet and 1 of fodder-beet and in the roots of plants obtained from these seeds 100 days after sowing. Results are tabulated.—E.B.O.

1250 WENT, F. W. **The physiology of the growth of sugar beets.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8,** Pt. 2, 319–24. [California Inst. Technol., Pasadena]

Data are given of the results of experiments in which sugar-beet was grown under different light intensities and photoperiods. The results showed that under relatively less favourable growing conditions, heterozygosity showed its greatest expression in differences of growth rate between individual plants. In pot trials, young sugar-beet plants were either harvested immediately, or subjected to additional periods of 7 or 3 days in 8-, 12-, 16- or 24-hr. photoperiods. There was a direct positive correlation between duration of illumination and dry-weight increase. Light intensities above 1000 ft. candles did not result in additional growth increases, showing that photosynthetic activity could not proceed faster than that produced by this intensity of illumination. In another experiment, sugar-beet plants were grown for 4 weeks in 8-, 16-, or 24-hr. photoperiods at temperatures of 7, 17, or 26°C., before being subjected to 24 hr. photoperiods for 1 week at light intensities of 800 or 1400 ft. candles at a temperature of 17°C. Plants grown at a temperature of 17°C. produced about twice as much dry matter as those grown at 7 or 26°C. Plants grown in an 8-hr. photoperiod had a greater growth potential than those grown in 16- or 24-hr. photoperiods. Plants previously grown at a temperature of 26°C. photosynthesized best at 1200 ft. candles, while those grown at 7 or 17°C. photosynthesized best at 600 ft. candles. There was evidence that beyond a certain density of foliage, there was no advantage to the plant in developing a larger leaf area.—P.J.B.

1251 ULRICH, A. **Growth and development of sugar beet plants at two nitrogen levels in a controlled temperature greenhouse.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8,** Pt. 2, 325–38, bibl. 11. [Univ. California, Berkeley]

Previous studies [see *Fld Crop Abstr.* 5 : 1181] showed that the growth of sugar-beet plants was closely related to their sucrose economy. The sugar first formed by the leaves is used to maintain basic metabolic processes. As more sugar is formed, leaves and fibrous roots are produced, after which, the sugar is used to increase the sucrose concentration in the main root. When concentrations of 6-8% are produced in the main root, surplus sugar is diverted primarily to storage-root formation. The present studies were made to determine whether plant development does, in fact, follow this sequence and to determine the extent to which the ripening processes are governed by self-regulatory mechanisms within the plant and by reactions to the external environment. Sugar-beet plants (variety U.S. 22/3) were grown in conditions of ample moisture and nutrients in vermiculite, at controlled temperatures in the greenhouse. Temperatures were 23°C. from 8 a.m. to 4 p.m. and 17°C. from 4 p.m. to 8 a.m. Natural day-lengths (Pasadena, California) were used over the trial period from 20 Jan., 1951 to 26 Aug., 1925. On 31 July, 1951, half the plants were grown in culture solutions containing no N, while the remainder continued as before on a high nutrient-level regime. Under conditions of high nutrient status, top growth appeared to have priority in the use of sugar supplies. The sucrose content of the roots increased from 4·6% on 20 Mar., 1951, to a maximum of 9·3% on 31 July, 1951 and declined to 3·9% by 11 Mar., 1952. Sucrose concentrations in 1952 failed to reach those of 1951. Thus, during the 83-week period of the trial, plants grown under these conditions failed to ripen. Root weights reached a maximum of 868 g. by 18 Dec., 1951 and crown weights reached a maximum of 2147 g. by 26 Aug., 1952. There was evidence that sugar-beet did not possess an internal mechanism for ripening. "Sugaring-up," as found under field conditions, was thought to be dependent on decreases of temperature during the day or night, to nutrient deficiencies or to unknown factors. Under conditions of low N supply, root- and top-growth declined and petiole-N values fell below the critical levels. The sucrose concentration in the roots rose to 12·1%, a value much below that found in the field. Combinations of low night-temperatures and low N supply appear to be conducive to high sugar contents. Under the conditions of high N supply and relatively high temperatures, sucrose produced in excess of that needed to maintain top- and root-growth appeared to be used for increasing the size of the storage root, rather than for producing more and larger leaves.—P.J.B.

1252 STOUT, M. **Some factors that affect the respiration rate of sugar beets.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8,** Pt. 2, 404–9, bibl. 6. [Fld Crops Res. Br., Agric. Res. Serv., U.S. Dep. Agric.]

It was shown in tests that sugar-beet roots retained CO_2 in their tissues when the CO_2 concentration in the surrounding air increased. Even small excess amounts of CO_2 in the tissues reduced root respiration. In further tests where the O_2 concentration of the air ranged from 1·65 to 35·3% and no CO_2 was present, the respiration rate of the roots increased in a linear manner as O_2 concentrations increased. Below concentrations of 4–5% O_2, some anaerobic respiration occurred. In studies on the

effect of size of roots on respiration rate, it was shown that large roots respired more slowly than small roots, a fact that appeared to be correlated with the surface area of the roots. Respiration rates were positively correlated with the sucrose content of the roots, but not definitely correlated with the amino-N content, or K content ; there was a negative correlation with Na content. The roots of polyploid varieties respired less rapidly than those of normal diploid varieties.—P.J.B.

1253 LARSON, W. E. and JOHNSTON, W. B. **The effect of soil moisture level on the yield, consumptive use of water, and root development by sugar beets.** *Soil Sci.* 1955, **19,** No. 3, 275–9, bibl. 5. [Soil and Water Conserv. Res. Br., Agric. Res. Serv., U.S. Dep. Agric., and Montana Agric. Exp. Sta.]

Experiments were conducted to determine the effect of soil moisture level on yield, consumptive use of water and root development by sugar beets. The studies were made on areas with two water table depths to determine generally the extent to which sugar beets can use moisture in the moist zone immediately above a water table. When sugar beets were allowed to remove 43, 75 and 95% of the available moisture in the root zone prior to irrigation, yields were 23·4, 22·0 and 16·9 tons per acre, respectively, in an experiment where plants could not obtain ground water. In a second experiment on an area with a water table at 4 to 4·5 feet below the soil surface, yields were 22·9 and 23·5 tons per acre when plants were allowed to extract 54 and 66%, respectively, of the available moisture prior to an irrigation. A third treatment not receiving irrigation, but drawing heavily on ground water, yielded 20·1 tons per acre. Consumptive use of water for the growing season by sugar beets was 23·4, 22·5 and 19·0 inches, depending on whether 43, 75 or 95% of the available moisture was removed prior to an irrigation. The largest amount of water was lost from the surface foot of soil in all periods of measurement with progressively smaller amounts from deeper depths on the two wetter treatments. Moisture use was related to the depths containing available moisture in the dry treatment. Moisture level had no effect on the rate of root extension or the shape of the commercial root.—Authors' abstract.

1254 COONS, G. H. **The wild species of *Beta*.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8,** Pt. 2, 142–7, bibl. 7. [Fld Crops Res. Br., Agric. Res. Serv., U.S. Dep. Agric., Beltsville, Maryland]

A proposed arrangement is given for dividing the wild species of *Beta* into groups on the basis of their natural affinities. The sections suggested are : *Vulgares, Corollinae, Nanae* and *Patellares* and 13 species of *Beta* are assigned to these sections. Brief notes are given on the affinities and characteristics of the individual species.—P.J.B.

1255 HAC, L. R. and others. **1. The effect of fertilization on the glutamic acid content of sugar beets in relation to sugar production. 2. Nitrogen fertilization in the Woodland, California, area.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8,** Pt. 2, 386–91, bibl. 10.

The results are given of studies during 1946–51, in which the following problems were investigated : the response of glutamic-acid content to different levels of N treatment, the response to different levels of N at different harvest dates and the response of different varieties receiving different levels of N supply. Amounts of N ranging from nil to 240 lb. per ac., as ammonium nitrate, were applied. The N treatments resulted in significant increases in glutamic-acid content on 15 out of 16 trial plots. On only 2 out of 16 trial plots, was there any significant deviation from a straight line response of glutamic-acid content to increasing levels of N treatment. In one trial series, amounts of N ranging from nil to 2500 lb. per ac. were applied. Sucrose contents where nil and 625 lb. N per ac. were applied were 15.8 and 12·6%, respectively ; higher rates of N treatment did not result in further reductions in sucrose content. Glutamic-acid contents were 0·22% where no N was applied, 0·4% where 625 lb. N per ac. were applied, and rose to a maximum of 0·61% where 2500 lb. N per ac. were applied. In trials on the effect of harvest date on glutamic-acid content, harvesting was carried out on 28 Sept., 1 Nov., or 13 Dec., 1951, and amounts of nil, 80, 160 and 240 lb. N were applied. Decreases in glutamic-acid content with delayed harvest were significant only where no N was applied. In comparisons of 6 commercial sugar-beet varieties, no great differences in glutamic-acid content or in the response of glutamic-acid content to N treatment, were found.—P.J.B.

1256 EDINBURGH AND EAST OF SCOTLAND COLLEGE OF AGRICULTURE. THE EDINBURGH SCHOOL OF AGRICULTURE. **Experiments on type and level of nitrogenous fertiliser for sugar beet, 1951 to 1953.** *Tech. Bull. 13. Edinb. E. Scot. Coll. Agric.* 1955, pp. 16.

In their effects on yield of sugar and yield of tops from sugar-beet, there were no significant differences between equivalent amounts of ammonium sulphate and nitrochalk. Applications of 2 cwt. ammonium sulphate, or 2·7 cwt. nitrochalk, increased the yield of roots and tops. Higher dressings of N reduced the percentage of sugar and did not increase root yields significantly, except in 2 localities in 1951 where N appeared to be deficient. With up to 5·4 cwt. nitrochalk, the increase in tops was 0·82 tons per cwt. of fertilizer, above this the increase was 0·68 tons per cwt.—M.P.

1257 Lefèvre, G. and Hiroux, G. Type de fumure azotée et fumure potassique de la betterave sucrière. [**Type of nitrogen- and potassium-fertilizer for sugar-beet.**] *Ann. Inst. nat. Rech. agron., Paris. Sér. A. Ann. agron.* 1955, **6,** No. 6, 1035–53, bibl. 2, illus. [Sta. Agron., Amiens, France]

The effect was studied of applying 100 kg. N/ha. in different forms ($NaNO_3$, Ca $(NO_3)_2$, NH_4NO_3) in the presence of different quantities of K (0, 150 and 300 kg. K/ha. as 58% KCl) on the yield of sugar-beet var. Polybeta. The general effect of N fertilization was to increase the growth of tops and roots but the increase in yield of tops far exceeded that of the roots, and the abundance of the top growth was not accompanied by a corresponding increase in sugar content of the beet. This may have been due to delayed maturity. The leaf/root ratio was greatest when NH_4NO_3 was employed and the root/leaf ratio was greatest (excluding controls) when $NaNO_3$ was applied in absence of K. KCl was without effect on yield of tops or roots but there was an increase in the K content of all plant tissues. If the tops are to be ploughed-in for manure, their high K content has to be taken into consideration when planning manuring of the land for the next crop.—D.B.

1258 Althoff, W. Rübenvereinzeln mit neuem Gerät. [**Singling of beets with a new implement.**] *Dtsch. landw. Pr.* 1956, **79,** No. 22, 210, illus.

An implement is described and illustrated for singling fodder- and sugar-beet plants conveniently and rapidly. The implement resembles a 2-pronged fork, the end third of each prong being bent outwards at right angles, flattened and sharpened.—D.B.

1259 Donà dalle Rose, A. and Dal Monte Casoni, P. Ulteriori indagini sull'azione dell'idrazide maleica sulle barbabietole irrorate in campo. [**Further investigations on the effect of maleic hydrazide on sugar-beets sprayed in the field.**] *Ann. Sper. agr.* 1956, **10,** No. 1, 275–88, bibl. 5, illus., English summary. [Sta. Sper. Bieticolt., Rovigo, Italy]

[See also *Fld Crop Abstr.* 8 : 163.]

1260 American Society of Sugar Beet Technologists. **Proceedings.** *Proc. Amer. Soc. Sug. Beet Technol.* 1954, **8,** Pt. 2, pp. 458.

Investigations reported :

1. Characterization of sugar-beet varieties on the basis of their internal structure together with the effect of environment on the variability of diagnostic character in inbred lines. By E. Artschwager, pp. 118–24.
2. Forms of nitrogen as related to sugar-beet seed production in Oregon. By R. A. Pendleton, pp. 140–1.
3. The wild species of *Beta*. By G. H. Coons, pp. 142–7. [See Abs. 1254.]
4. The physiology of the growth of sugar-beets. By F. W. Went, pp. 319–24. [See Abs. 1250.]
5. Growth and development of sugar-beet plants at two nitrogen levels in a controlled temperature greenhouse. By A. Ulrich, pp. 325–38. [See Abs. 1251.]
6. Effects of quantity of mineral nutrients on germination and seedling growth of sugar-beets. By F. W. Snyder, pp. 340–3. [See Abs. 1248.]
7. The relation of soil-water levels to mineral nutrition of sugar beets. By O. J. Kelley and J. L. Haddock, pp. 344–56.
8. The effect of fertilizer applications on leaf analysis and yield of sugar-beets. By J. T. Alexander and others, pp. 370–9.
9. 1. The effect of fertilization on the glutamic-acid content of sugar-beets in relation to sugar production. 2. Nitrogen fertilization in the Woodland, California, area. By L. R. Hac and others, pp. 386–91. [See Abs. 1255.]
10. Some factors that affect the respiration rate of sugar-beets. By M. Stout, pp. 404–9. [See Abs. 1252.]
11. A method for determining respiration rate and sampling for chemical analysis of individual sugar-beets. By M. Stout, pp. 410–16. [See *Fld Crop Abstr.* 8 : 919.]
12. Some recent advances in the physiology and biochemistry of respiration. By M. Stout, pp. 417–23.—P.J.B.

TURNIPS

1261 National Vegetable Research Station. **Sixth Annual Report, 1955.** Wellesbourne, 1956, 38–42, illus.

Irrigation experiments with the turnip variety White Milan, indicated that a high soil-moisture content from establishment to root swelling was not beneficial, whereas, during the 3 weeks prior to harvesting, soil-wetness was most beneficial, and soil-dryness most harmful. In studies on the loss of water from plant/soil systems, data obtained from a turnip crop indicated that the daily estimates of water loss, made by Penman's method, were no less satisfactory than those made over longer periods. Estimated values expressed as percentages of the total water loss agreed well with the result of direct measurement, but when expressed in inches they were consistently below those of the measured values. Nearly half the total water loss from the turnip crop occurred when the plants were completely covering the ground.—M.P.

POTATOES

1262 Lüddecke, F. Die Dammkultur und die Quadratnestpflanzung im Kartoffelbau. [**Ridge cultivation and square-pocket planting of potatoes.**] *Dtsch. Landw.* 1956, **7,** No. 5, 218–21, bibl. 6. [Eastern Germany]

Trials during 1954–5, in 5 localities, indicated that ridge cultivation of potatoes was equal, or slightly superior, to the square-pocket method, in terms of tuber and starch yields, except when growing conditions were unfavourable to high yields. Ridge cultivation was more suitable for light, dry, sandy soils than for heavier loams. Either method appeared suitable for intermediate soils. The spacing used was 62·5 × 30–40 cm. for ridge cultivation, and 62·5 × 62·5 cm. for the square-pocket planting.—M.P.

1263 Fulton, J. M. and Murwin, H. F. **The relationship between available soil moisture levels and potato yields.** *Canad. J. agric. Sci.* 1955, **35,** No. 6, 552–6, bibl. 9. [Canada Dep. Agric., Harrow, Ontario]

Irrigation water was applied to early potatoes when the available soil-moisture at 6 in. dropped to 25, 50 and 75%. Applied when the level reached 75%, it was no more effective than when applied at the 50% level. Irrigation at the 50% level produced higher yields than that applied at 25%. Yield increase was expressed in increased tuber-size rather than in tuber number. The results support the view that tuber-growth is drastically slowed down as the available-moisture level drops, even though the root-zone still contains a considerable supply. For best production, it must not fall below 50%.—J.F.C.

1264 Akeley, R. V. and others. **Effect of planting dates on yields, total solids, and frying and chipping qualities of potato varieties.** *Amer. Potato J.* 1955, **32,** No. 12, 441–7. [U.S. Dep. Agric., Beltsville, Md]

In field trials at Presque Isle, Maine, in 1950–2, 8 potato varieties were planted on approximately 5, 15 and 25 May, and 4 June. The yields from the plots planted on 5 May exceeded those planted on 4 June by 22–75% according to variety. The percentages of total solids were, on an average, highest from the earliest planting dates. As to cooking qualities, there was an advantage from the earliest plantings with some of the varieties, but Kennebec and Irish Cobbler produced acceptable chips and French fries regardless of the date of planting.—E.B.O.

1265 Pomme de Terre Française. Catalogue des espèces et variétés de pommes de terre. [**Catalogue of species and varieties of potatoes.**] *Pomme de terre Fr.* 1956, **19,** No. 200, 1–24.

The 40 varieties (from France, England, Germany and the Netherlands) admitted for trial in France in 1956 are described under the following heads: origin; tuber characters (colour of skin and of flesh, size, position of eyes, sprout characters); plant characters (height, habit, stem, leaf, flower, fruit and stolon); and physiological characters (earliness, disease resistance, use, yield). The varieties are classified in 4 groups according to authorized size and weight.—D.B.

1266 Schick, R. and Gall, H. Zur Sortenwahl bei Kartoffeln. [**Choice of potato varieties.**] *Dtsch. Landw.* 1956, **7,** No. 3, 114–26, bibl. 4, illus. [Inst. Pflzücht. Gross-Lüsewitz, Dtsch. Akad. Landwirtschaftswissenschaft, Berlin (R.S.); and Zentralstelle für Sortenwesen, Min. Land- und Forstwirtschaft, Berlin (H.G.)]

In order to develop potato production in Eastern Germany on a soundly organized basis, trials were conducted from 1951–4 with 22 varieties, representing early, medium-early, medium-late and late types, at 27 stations throughout Eastern Germany. A map gives the distribution of these stations and delineates 5 zones of suitability for potato production ranging from unhealthy areas to those suitable for multiplication. The characteristics of each station, e.g. altitude, nature of top soil and subsoil, level of water table, and "soil-value index" are tabulated. Two tables show the relative yield of tubers and relative yield of starch from all varieties at all stations, while other tables give such features as shape and size of tuber, date of maturity, depth of eyes, flesh colour, cooking quality, occurrence of scab, resistance to virus and resistance to weed infestation. For each variety, a brief account is given of its soil requirements, its performance and, where applicable, the regions in which it grows best. The late and medium-late are the most important types for the East German potato crop, occupying 70–80% of the total area under potatoes. In this group, Capella gave the highest yield of tubers and of starch. Above-average yields of tubers were obtained from Star, Mira, Ackersegen, Nova and Merkur, the first two giving also above-average yields of starch. Aquila, Hilla, Johanna and Sanita gave below-average yields of tubers. Low starch yields were obtained from Nova, Sanita and Hilla. Among the medium-early varieties (cultivated without previous sprouting), Frühnudel was outstanding for good yield of tubers and starch. Of the early potatoes, Frühmölle and Sieglinde were the best for tuber- and starch-yield. The effects of the sprouting treatment are of special interest for the early potato crop. Vera, Anemone and Frühmölle were particularly suitable for sprouting before planting and produced tubers large enough

or lifting by 20 July. Finally, a comprehensive able, based on all the data, can be consulted for dvice on varieties to plant in the different potato ultivation regions and types of soil.—D.B.

1267 Schröder, O. Geeignete Stärkekartoffeln. [**Suitable potatoes for starch.**] *Stärkekartoffel* 1956, **1,** No. 2, 2.

The requirements for a good starch potato are : a tarch content of at least 18% ; a starch yield of 000 kg./ha. ; thin-skinned tubers ; and good eeping qualities. For sandy soils, the variety apella best meets these requirements. It is, owever, late in maturing because of its sensitivity o late spring frosts. This defect was overcome y planting sprouted tubers. Maritta, Herkula nd Carmen can be recommended for good oils.—D.B.

1268 Rieman, G. H. and Young, D. A. **Antigo : a new white, medium-maturing potato variety resistant to common scab** [*Streptomyces scabies*]. *Amer. Potato J.* 1955, **32,** No. 11, 407–10, bibl. 2. [Wisconsin Agric. Exp. Sta., Madison]

1269 Dadd, C. V. **Sprouting seed potatoes in fluorescent light.** *Agric. Rev., Lond.* 1956, **2,** No. 2, 36–8.

The developments in the use of fluorescent light or sprouting seed potatoes in Britain and the Continent are briefly reviewed and the design and management of installations are discussed. This practice is to be considered as a supplement to daylight sprouting, or, in certain circumstances, as a useful alternative.—M.P.

1270 Zimmermann-Griess, Sara. **Keeping- and planting-qualities of sprouted seed potatoes.** *Ktavim* 1956, **4,** No. 2, 21–3, bibl. 2. [Agric. Res. Sta., Rehovot, Israel]

Potato tubers which have sprouted before lifting, while still joined to the parent plant, keep less well than those which have not sprouted. In cold storage at 8°C. the former show a greater percentage of rot. For either autumn- or spring-planting, tubers which have sprouted before the harvest and remained sound throughout storage at 8°C. are not significantly inferior in sprouting, growth and yield to tubers which have not sprouted. —From author's summary.

1271 Bonde, R. and Covell, Mildred. **Effects of spray treatments on yield rate and specific gravity of potatoes.** *Amer. Potato J.* 1955, **32,** No. 11, 399–406, bibl. 5. [Maine Agric. Exp. Sta., Orono]

The specific gravity of potatoes was lowered by any factor which caused premature death of the plants. Among these factors was defoliation by late blight and by insects. A spray treatment, which gave good control of the disease and pests, raised the specific gravity and also tended to improve yields. Plants sprayed with Bordeaux mixture and tribasic copper sulphate generally produced potatoes of high specific gravity, provided that late blight was controlled, but these fungicides had a tendency to decrease yields in comparison with other fungicides tested.—From authors' summary.

1272 Poos, J. A. J. **The autumn-raising of potato-seedlings in the open.** *Euphytica* 1955, **4,** No. 3, 211–14, Dutch summary. [C.I.V. Pl. Breed. Sta., Veghel, Neth.]

The advantages to the potato-breeder of autumn- compared with spring-raising of seedlings are considered. Their selection for resistance to blight is made easier by autumn-raising, as the natural infection is then very heavy. Reduced aphis attack at that time is another advantage. Also, spring-sown seedlings become contaminated with virus and have to be lifted by mid-July before the action of blight can be studied.—J.F.C.

1273 Aebi, H. Principes de lutte contre le mildiou de la pomme de terre. [**Principles involved in the control of mildew on potato.**] *Rev. rom. Agric.* 1956, **12,** No. 4, 29–31, bibl. 2, illus. [Sta. Féd. Essais Agric., Lausanne]

1274 Farming in South Africa. **Damage amounting to millions of pounds caused annually by eelworms.** *Fmg in S. Afr.* 1956, **32,** No. 2, 21–5, illus.

Fumigation of potatoes against eelworm at Riet River, with a 40% E.D.B. solution at a rate of 80 gal. per morgen [1 morgen = 2·116 ac.], gave only a 75% clean crop where the penetration depth was 12 in. Where the penetration was only 6 in. the eelworm control was still poorer. Fumigation also proved uneconomical. Rotation cropping is recommended, using cotton and groundnuts, and more particularly *Eragrostis curvula*, Ermelo type, since this grass is resistant to eelworm. The grass phase of the rotation should last 4–5 years ; if well fertilized it is a good source of pasturage for livestock.—M.P.

1275 Simon, W. and Bollmann, W. Ein Beitrag zur Drahtwurm-Bekämpfung. [**Control of wireworm.**] *Dtsch. Landw.* 1956, **7,** No. 3, 142–4, illus. [Inst. Acker- und Pflbau Müncheberg, Mark, (W.S.), and Biol. Inst. des VEB Fahlberg-List, Magdeburg (W.B.)]

Wireworm is particularly rife in Thüringen, Saxony and Mecklenburg. Satisfactory control has been obtained with Arbitex mulch, a Lindane

product. For cereal crops, 10 kg. Arbitex mulch was mixed with 100 kg. seed and the mixture drilled. Seed so treated produced 170 plants per sq. m., while untreated seed produced only 90 plants per sq. m. Sugar- and fodder-beet seed, already treated with Germisan, was mixed with Arbitex in powder or mulch form. Stecklings were protected by placing 1–2 g. Arbitex in the soil pocket for each plant. Potatoes were protected with Arbitex soil mulch at the rate of 50 kg./ha. Applied at this rate, ware potatoes do not acquire an unpleasant flavour. The profit from increased yields exceeds the cost of materials and labour.—D.B.

1276 BERCKS, R. Feldversuche über die Ausbreitung des Kartoffel-X-Virus. [**Field studies in the spread of potato virus X.**] *Züchter* 1956, **26,** No. 4/5, 155–7, bibl. 5, illus. [Biol. Bundesanst. Land- und Forstw., Inst. Virusserologie, Braunschweig]

Plot trials during two years with the potato variety Flava, showed some variation in the extent of spread of potato virus X from infected plants. But, in all cases where the usual cultivations had been carried out, more plants became infected than where no cultivation had been done after the potatoes had sprouted.—M.P.

1277 WENZL, H. Sommeranbau als Massnahme gegen Abbau durch knollenübertragbare Kartoffelviren und gegen Fadenkeimigkeitsabbau. [**Summer cultivation as a measure for preventing the degeneration [of the potato crop] by tuber-borne virus diseases and hair-sprouts.**] *Bodenkultur* 1955, **8,** No. 3, 274–306, bibl. 70. [Bundesanst. Pflanzenschutz, Wien, Austria]

The advantages and disadvantages were investigated of summer cultivation of potatoes in a region of dry, hot summers such as eastern Austria. The work centred round the effect of time of planting on the severity of outbreaks of tuber-borne virus diseases, and the wilt disease and hair-sprout diseases caused by *Colletotrichum atramentarium* and on the quality and quantity of the tuber yield. As regards tuber-borne virus diseases, attacks were heaviest when the potatoes were planted in May and June, less when planted in April and least when planted in late July. Diseases attributed to *C. atramentarium* attacked potatoes equally whether planted in April or May. If planted in June the infection was slight ; and the disease was almost non-existent in potatoes planted in July. However, owing to the summer drought, the later the planting the lower was the yield, and the smaller were the tubers. Also, the likelihood of October frosts increases the risk from late planting. Therefore, if irrigation is not possible, it is recommended that, for dry regions, potatoes should be planted early in April after pre-sproutin and the discarding of those tubers which produc hair-sprouts.—D.B.

1278 ROBINSON, D. B. and CALLBECK, L. C **Stem streak necrosis of potato in Princ Edward Island.** *Amer. Potato J.* 1955, **3** No. 11, 418–23, bibl. 7, illus. [Dep. Agric Ottawa, Canada]

Evidence is presented that stem-streak necrosis i Prince Edward Island occurs only on very aci soils, and is probably a direct effect of Mn toxicity The application of a high level of NPK fertilize and of lime markedly reduced the severity of th disease. The varieties Cherokee, Irish Cobbler an Sebago are susceptible, whereas Canso, Gree Mountain and McIntyre are resistant.—E.B.O.

1279 KING, J. R. **Irish potato pollen storage** *Amer. Potato J.* 1955, **32,** No. 12, 460–6 bibl. 28. [Louisiana State Univ., Bato Rouge]

1280 WILLIAMS, Elizabeth J. **Seed failure in th Chippewa variety of *Solanum tuberosum*** *Bot. Gaz.* 1955, **117,** No. 1, 10–15, bibl. 5 illus. [Univ. Wisconsin, Madison, U.S.A. [Received May, 1956]

The production of abundant parthenocarpic frui followed self-pollination in the Chippewa variety o potato grown in the field. Its cause was investigate and found to be due to deteriorating ovules an endothelial enlargement.—D.B.

1281 NATURE, LONDON. **The tuber-bearing specie of *Solanum.*** *Nature, Lond.* 1956, **177** No. 4516, 927.

A review is given of the work of J. G. Hawkes i *Proc. Linn. Soc.* 1956, 166, Nos. 1 and 2, p. 97 which comprises a critical taxonomic study o these species, with special reference to *S. tuberosum* and the tetraploid species complex. It is con cluded that *S. tuberosum* was derived from a already cultivated diploid species and not directl from a wild one.—M.H.

1282 BRÜCHER, H. Kritscher Betrachtungen zu Nomenklatur argentinischer Wildkartoffeln 1. Die Serie *Commersoniana.* [**Critica observations on the taxonomy of Argentin wild potatoes. 1. The series *Commersoniana.*** *Züchter* 1956, **26,** No. 4/5, 97–106, bibl. 23 illus. [Univ. Nac. de Cuyo, Mendoza, Argen tine]

The author considers " that many of the North Argentine species of the series *Commersoniana* have been misinterpreted in the German, Russian and English plant breeding literature." He reports on a 5-years' detailed study into the question.—M.P.

1283 MADEC, P. and PERENNEC, P. Les possibilités d'évolution des germes de la pomme de terre et leurs conséquences. [**Possibilities in the development of potato sprouts and their importance.**] *Ann. Inst. nat. Rech. agron., Paris. Sér. B. Ann. Amélior. Pl.* 1955, **5,** No. 4, 555–74, bibl. 12, illus. [Lab. Rech. Pomme de Terre, Landerneau, France]

Since it is known that tuber-forming stolons can be formed on sprouts of the parent tuber without the development of aerial foliage, such tubers were used to study the effect of light, temperature, method of storage and varietal differences on tuber formation. The stage between the appearance of the sprout and the formation of tubers is here called incubation, the duration of which is a varietal character influenced by the environment; it is, for example, shortened by an increase in temperature, high humidity and darkness. [See also *Fld Crop Abstr.* 8 : 1345.]—D.B.

1284 STEINECK, O. Untersuchungen über die photoperiodische Reaktion einiger Kartoffelsorten. [**The photoperiodic reactions of some potato varieties.**] *Bodenkultur* 1955, **8,** No. 3, 254–62, bibl. 17, illus. [Hochsch. Bodenkultur, Wien, Austria]

Several European varieties were examined for the effect of length of day on tuber production. Saskia, Bintje, Sieglinde, Erstling and Ackersegen were day-neutral. Jakobi reacted as a short-day plant and bolters amongst the Erstling plants were regarded as short-day mutants. The reaction of *Solanum tuberosum* to photoperiod is judged by its effect on tuber formation rather than on flowering. But since short day reduced leaf production, and hence the assimilating material, it is thought that growth of tops should also be taken into consideration when judging the reaction of potato varieties to length of day.—D.B.

1285 STEINECK, O. Die photoperiodische Reaktion von "Schosser"-Stauden der Sorte Erstling. [**The photoperiodic reaction of "bolters" in the variety Erstling.**] *Z. Pflzucht.* 1955, **35,** No. 2, 137–48, bibl. 14, illus. [Hochsch. Bodenkultur, Wien, Austria]

Above-ground and underground parts of potato plants which had "bolted" are described, and an account is given of their return to normal growth on changing the day-length under which they were growing. Bolters are here defined as plants which, by mutation, have changed their character as regards their photoperiodic requirement, and as such must be eliminated.—D.B.

1286 ŽURBICKIĬ, Z. I. and VARTAPETJAN, S. M. [**The influence of the polar summer day on assimilation and tuber formation in potato.**] [Russian] *Fiziol. Rast. (Pl. Physiol., USSR)* 1956, **3,** No. 1, 58–65, bibl. 6, illus.

Experiments carried out with $C^{14}O_2$ indicated that for a 12-hr. day assimilation was 1·5 times higher and the flow of the assimilates from the leaves to tubers was 6 times higher than that observed for the polar day. As a result, tubers begin to form 2 weeks earlier under short-day conditions, whereas the vegetative mass grows intensively under polar-day conditions. These facts do not agree with data, cited in the literature, obtained by illuminating the plants with artificial light which affects them unfavourably. The true reaction of the plant to daylength can be found only by carrying out experiments under sunlight. The positive reaction of potato to short day and moderate temperature can be explained by its origin from southern mountainous regions. The total amount of organic matter accumulated is higher for the polar day. A radio-autograph shows that the assimilates containing C^{14} move along the vascular bundles of the stem. To a certain extent it was possible to counteract the unfavourable influence of the long day and to accelerate tuber formation and increase the carbohydrate content by feeding the plant with easily available nitrogen before flowering began (in order to increase growth of the vegetative mass) and then by intensively supplying it with potassium and phosphorus during tuber formation.—From authors' English summary.

1287 HUTCHINSON, A. and HILTON, R. J. **The influence of certain cultural practices on solanine content and tuber yields in Netted Gem potatoes.** *Canad. J. agric. Sci.* 1955, **35,** No. 5, 485–90, bibl. 25. [Dep. Pl. Sci., Univ. Alberta, Edmonton, Alberta]

The bitter flavour which may occur in this potato is due to excess solanine. Experiments were carried out to determine the effect of cultural practices on its amount. Plots were subjected for 2 seasons to 2 depths of planting, 3 levels of hilling and 2 dates of planting with single- and multiple-eye seed-pieces. No differences in solanine content or in tuber yield were found to result. Fertilizer and wetness of season did not affect the content, but a marked increase occurred after a top-killing frost. Very bitter samples from several places contained toxic levels, and it was found that, at certain stages, unfavourable conditions had occurred, such as frost or hail, or particular temperature- and insolation-conditions, and had probably contributed to physiological disorder.—J.F.C.

1288 LE TOURNEAU, D. **Potato composition. Carbohydrate components of the potato tuber.** *J. agric. fd Chem.* 1956, **4,** No. 6,

543–5, bibl. 19. [Univ. Idaho, Moscow, U.S.A.]

The studies reported were made to distinguish between the different polysaccharide fractions present in Russet Burbank tubers and to determine qualitatively the constituent sugars in these fractions.—P.J.B.

1289 HARWARD, M. E. and others. **The relationship of chloride and sulfate ions to form of nitrogen in the nutrition of Irish potatoes.** *Soil Sci.* 1956, **20,** No. 2, 231–6, bibl. 19. [Dep. Agron. and Stat., North Carolina Agric. Exp. Sta., Raleigh]

1290 HARWARD, M. E. and others. **Effects of soil moisture tensions and of chloride and sulfate treatments upon the yield, composition, and bacterial soft rot of Irish potatoes.** *Soil Sci.* 1956, **20,** No. 1, 59–65, bibl. 20. [Dep. Agron., Pl. Path. and Stat., North Carolina Agric. Exp. Sta.]

1291 EDWARDS, G. H. A. and others. **Manuring potatoes with NPK.** *Exp. Husb.* 1956, No. 1, 25–43, bibl. 3.

Between 1949 and '54 trials were conducted in the West Midlands, Welsh, and Lancashire and Yorkshire Provinces to test the effect of NPK (3 levels in all combinations) on the yield of potatoes. In one series of experiments no dung was used. In another series the fertilizer was used with and without dung. Details regarding quantities of fertilizer, soil analysis etc. are tabulated. " In all Provinces there were substantial responses to nitrogen, and especially to potash. In Wales a good response to phosphate was also found, but in the West Midlands and the Yorks and Lancs Provinces the responses to the higher dressings of phosphate were not always profitable. There was a fair relationship between the soil phosphate and potash status as determined by analysis and the yield responses obtained, but the number of experiments was too few and the range of soil types too wide for any very definite conclusions to be drawn. In a further series of trials in the West Midlands and the Yorks and Lancs Provinces, nitrogen, phosphate and potash fertilizers for potatoes were tested in the presence and absence of dung. The results of these trials confirmed the findings of Crowther and Yates that FYM has great value for potatoes and that where it is given, the supplement of inorganic phosphate and potash can be reduced but not the nitrogen. The need for more work on particular soil types in order to relate soil analysis with fertilizer response is emphasized."—D.B.

1292 CULPIN, S. and GREAVES, D. W. B. **Late application of fertilizer for potatoes.** *Exp. Husb.* 1956, No. 1, 44–7. [Gleadthorpe Ex Husb. Fm, Welbeck, nr Mansfield, Notts]

In a 3-yr. experiment on a light sandy soil, miner fertilizer (at 11 cwt./ac.) was applied early ar late. The early application was the tradition one of broadcasting over the ridges immediate before planting ; in the late application, th mineral fertilizer was broadcast over the crop weeks after 50% emergence. The fertilizer w applied in three ways : all early, all late, or pa early and part late. The 3-yr. average respon to fertilizer was 3·7 tons of potatoes in the presen of dung and 5·1 tons in its absence. The respon to dung was 1·3 tons in the presence of fertiliz and 2·7 tons in its absence. Despite this lar response to fertilizer there was very little differen in yield due to the method of application. La applications were as good as the tradition method and there was no benefit in applying son of the fertilizer early and some late.—D.B.

1293 SIMPSON, K. **Soil potassium and pla growth.** *Scot. Agric.* 1955–6, **35,** No. 146–8, bibl. 2.

Plant-consumption, sources, functions and pla deficiency-symptoms of K are reviewed. D ficiency can be absolute, or relative to N, Ca or M Yields of potatoes are severely depressed by hig N/K, but the effect is temporary ; the effect lime in relative excess is prolonged. In S. Scotland, some soils are seriously deficient in and experiments in which K was applied potatoes gave increases of 3 and 4 tons/ac. (c 9 tons) per 1 and 2 cwt. KCl, where deficiency w not apparent. The response by sugar-beet was 18 cwt./ac. of extra sugar, compared with 3 cwt. averag for the whole country, per 2 cwt. KCl.—J.F.C.

1294 FULTS, Jess L. and PAYNE, Merle G. **Th effect of 2,4-D and maleic hydrazide o sprouting, yields and color in Red McClu potatoes.** *Amer. Potato J.* 1955, **32,** No. 1 451–9, bibl. 38. [Colorado Agric. Exp. Sta Fort Collins]

Plot trials were carried out in 1952 and '53 determine the best method for treating Re McClure potato plants both with 2,4-D for impro ing tuber colour and with maleic hydrazide f inhibiting sprouting. The treatments were applie either early, on 28 and 23 July, or late, on 28 and August. The results indicated that these 2 pr parations may be used either alone or in combin tion, and either early or late, without loweri yields significantly. Probably the best procedure f obtaining a dark red colour and maximum spro inhibition is to use 2,4-D early and maleic hydr zide late. Maleic hydrazide and 2,4-D either us together in the same spray or in separate sprays at 24 hr. interval, either early or late, failed to produ significant increases in colour.—E.B.O.

1295 Emilsson, B. **Treating ware potatoes with sprout-inhibiting chemicals. Research in Sweden 1948-1954.** *Acta agric. scand.* 1955, **5,** No. 4, 390–406, bibl. 29. [Inst. Pl. Res. and Cold Storage, Nynäshamn, Sweden]

An appraisal is given of the action of TCNB, IPC, MENA, METER, PU (as powders) and of MH (as spray) on the inhibition of sprouting during storage, on physiological-weight loss, on loss through disease and on cooking quality. To inhibit sprouting, 3–4·5 g. TCNB/100 kg. of potatoes was suitable; below the 3 g. rate its effect rapidly declined. The time of application of MENA proved important; in autumn at least 12 g., and in spring 9–12 g. were needed. Similar amounts of PU and METER were needed. IPC sufficed at a tenth of the rate of TCNB. The effects of MH applied at 1250–5000 g./ha. (about equal to the TCNB rate) were very variable. TCNB caused a significant decrease in % of diseased tubers. MH possibly caused a slight increase, while the others had no effect. All the powders caused a significant decrease in physiological-weight loss during storage. This was ascribed to inhibition of sprouting and hence of the higher rate of transpiration and respiration. MH did not decrease the weight loss; this was ascribed to its action on some factor causing increased loss. Flavour is classified under potato-, bitter- and soil-flavour. MENA and METER decreased bitter flavour, and TCNB slightly impaired all 3 flavour components. In no case did the effect on taste affect the value of the chemicals as sprout inhibitors. Inhibition caused by TCNB at the 12 g. rate was as efficient with full ventilation as without. In conclusion, TCNB and IPC were recommended. The mode of application of MH was considered advantageous, but MH itself was not recommended because of its unreliability, risk of harmful secondary effects and the fact that tubers treated with it could not be used for planting. The use of the chemicals was often not economic; it was economic when storage was extended to May-June. —J.F.C.

1296 Fischnich, O. Lagertemperatur und Keimstimmung von Kartoffelpflanzgut. [**Storage temperature and the germinating tendency in seed potatoes.**] *Kartoffelbau* 1956, **7,** No. 3, 52–5, bibl. 9, illus. [Forschungsanstalt für Landwirtschaft, Braunschweig-Völkenrode, W. Germany]

Potato varieties fall into 3 groups as regards optimum storage temperature: those with a storage optimum of (a) 4°C., (b) 7°C. and (c) 7°C. but with a capacity to tolerate 1–10°C. Varieties belonging to each group are listed.—D.B.

1297 Green, H. C. and Rounthwaite, T. E. **A study of the effect of dirt and damage on potatoes in storage.** *Tech. Mem. 127. Nat. Inst. agric. Engng* 1955, pp. 7.

An experiment was carried out to ascertain the effects on potatoes of storing them with different amounts of dirt. Damage treatments to the potatoes were included in the experiment. There were indications that the presence of soil maintained a slightly higher moisture content in the potatoes. The peeling tests showed the practical significance of different kinds of damage, splits in particular, in harvesting. With the potatoes stored in sacks where air could circulate freely, the presence of soil had no harmful effect, but in the clamp there was a slight temperature rise at the dirty end. The high moisture contents and the higher temperatures occurring in parts of the experiment encouraged chitting and supertuberization.—From authors' abstract.

1298 Wilson, A. R. **Indoor storage—a review of requirements.** *Agric. Rev.* 1956, **1,** No. 12, 18–23, bibl. 8, illus. [A.R.C. Potato Storage Invest., Sutton Bonnington]

"Within ten years the bulk of British-grown maincrop potatoes may be stored in buildings. This article discusses the principles of indoor storage—frost protection and ventilation and the control of sprouting, shrinkage and bacterial diseases." The comparative economics of clamp- and indoor-storage are under investigation. It is as yet impossible to assess the precise financial saving by indoor storage.—D.B.

SWEET-POTATOES

1299 Morris, L. M. and Mann, L. K. **Wound healing, keeping quality, and compositional changes during curing and storage of sweet potatoes.** *Hilgardia* 1955, **24,** No. 7, 143–83, bibl. 22, illus. [Univ. California, Berkeley]

At harvest, the skin of sweet-potatoes (*Ipomoea batatas*) is unavoidably broken and partly removed. The resulting wounds heal by suberization, if environmental conditions are favourable (85°F., >85% humidity). The healed wounds prevent water loss and are quite resistant to infection; the roots also become less susceptible to chilling injury. Three pre-storage treatments (storage-house, field-pile and warm-house curing) were applied to the Yellow Jersey, Porto Rico and Hawaiian varieties. After 2 weeks of the last 2 treatments, the roots were stored in the cool-house, as in the first treatment. The storage losses and quality changes were observed over 4 harvest years and the anatomy of periderm, natural and wound tissue, was studied during curing and storage. Warm curing yielded significantly more marketable potatoes in which weight loss was not

reduced, but rot loss was markedly reduced. Rot loss was very high in pile-curing, but chilling injury may have occurred. Dry-weight loss, as % of fresh weight, from harvest to the end of storage was slight except after warm curing near the end of storage, when heavy sprouting occurred. Wound healing was best during warm curing. In the other treatments, irregular and ineffective layers of cork continued to form during subsequent storage, causing a dark appearance. Total sugars (0·67% sucrose) doubled from harvest to mid-storage.—J.F.C.

OTHER

1300 HERNAEZ, A. **The root crops in the Philippines with special reference to cassava and camote.** *Philipp. J. Agric.* 1954, **19,** No. 1–2, 41–59, bibl. 9, illus.

Brief notes are given on the cultivation in the Philippines of cassava (*Manihot utilissima*), camote or sweet-potato (*Ipomoea batatas*) and, among minor root crops, *Dioscorea alta* and *D. esculenta*.—P.J.B.

1301 MALAVOLTA, E. and others. Estudos sôbre a alimentação mineral da mandioca (*Manihot utilissima* Pohl.). [**Studies on the mineral nutrition of cassava** (***Manihot utilissima***).] *An. Esc. Agric., Queiroz* 1954, **11,** 21–40, bibl. 11, English summary. [Univ. São Paulo, Brazil] [Received June, 1956]

1302† CONNOLD, W. Q. **Sulphuric acid for the control of weeds in kale.** *Agriculture, Lond.* 1956, **63,** No. 1, 21–2. [N.A.A.S., S.W. Province]

Many crops of kale and rape have been successfully treated with H_2SO_4 in England and Wales. The most troublesome weeds are: yellow charlock (*Brassica sinapis*), redshank (*Polygonum persicaria*) and fat-hen (*Chenopodium album*) which can be, respectively, controlled by 100 gal./ac. of spray containing brown H_2SO_4 at 10, 12·5 and 15 gal. Spraying is often adopted late as a last resort, but earlier applications may be better. Spraying at low volume should be avoided until more is known.—J.F.C.

1303 LÖHRKE, L. Beiträge zur Züchtung und zum Anbau der Topinambur (*Helianthus tuberosus* L.). 1. Vorverlegung des Blühtermins, Kreuzungen mit Sonnenblume (*Helianthus annuus*) und Selektion. [**Contribution to the breeding and cultivation of Jerusalem artichoke** (***Helianthus tuberosus***). **1. Advancing the date of flowering, crossing with sunflower** (***H. annuus***) **and selection.**] *Z. PflZucht.* 1956, **35,** No. 3, 321–44, bibl. 40, illus. [Inst. Obstbau und Obstzüchtung Marquardt bei Potsdam, E. Germany]

A history of the cultivation of the Jerusalem artichoke in Germany and France precedes the account of the experimental work. Short-day treatment failed to produce flowering in *H. tuberosus* earlier than mid-October, which is the normal flowering date in the climate of Central Europe. *H. tuberosus* grown under short-day treatment began to form tubers in mid-June and ceased vegetative growth in mid-August, without flowering, whereas control plants began to produce tubers normally from late July to early August and ceased vegetative growth in November.—D.B.

FIBRE CROPS

COTTON

1304 CHANDNANI, J. J. **Studies on the cultivation of *Gossypium hirsutum* in Delhi tract.** *Indian Cott. Gr. Rev.* 1956, **10,** No. 1, 29–36 [Agron. Div., Indian Agric. Res. Inst., New Delhi]

Experiments conducted during 1950–3 suggested the following conclusions: (1) *G. hirsutum* varieties can be grown successfully in Delhi. (2) Optimum sowing period is from 25 April to mid May. (3) Among Punjab-American varieties, M 4 320-F and 216-F, in order of time taken to reach maturity, were found suitable. The earliest, M-4 was recommended for May sowing. Other American varieties, 216-F/14, and 0394 (both early and high yielding) and BC-68 (a later variety with better staple length), were found suitable. (4) Optimum spacing for Punjab-American types is 2 ft. between the rows. (5) Chilean sodium nitrate is superior to ammonium sulphate for cotton. (6) Sowing date affects the ginning percentage; the earliest sowing date resulting in the highest percentage. Sowing date also affects the quality of fibre and the value of the lint produced. These effects vary with the variety. (7) It is possible to grow a food- and fibre-crop on the same land in the same year.—From author's summary and conclusions.

1305 HAMILTON, J. and others. **Cotton growth and production as affected by moisture, nitrogen and plant spacing on the Yuma Mesa.** *Soil Sci.* 1956, **20,** No. 2, 246–52 bibl. 9. [Soil Water Conserv. Res. Br. Agric. Res. Serv., U.S. Dep. Agric., and Arizona Agric. Exp. Sta.]

Acala 44 cotton was grown near Yuma on irrigated loamy sand having a steep productivity gradient across the field. The effects of soil moisture, N rate and plant spacing, each at 3 levels, were determined for vegetative growth, fruiting, N uptake, yield, ginning and fibre characteristics. Yield

were much increased by N, and less by moisture and spacing. The spacing effect was limited to the second picking. Among the factors : total flowers, % boll-set and % lint, NP fertilizer affected, two and spacing four. Cotton growth and yield were unsatisfactory where substantial cuts were made in levelling the field before planting. Relative response to a given treatment was remarkably consistent in spite of the productivity gradient. About 90% of the yield variation was correlated with plant size. Larger plants had higher yields because of increasing boll size and total flowers per acre, but did not differ significantly in boll set or in % lint. Fruiting efficiency was affected only by spacing, width of which was positively correlated with cotton production per unit of total plant weight. The effects of moisture, N and spacing are tabulated for 21 different factors besides yield. Moisture affected 0, nitrogen 11, and spacing 16 of these growth-, fruiting-, N composition- and fibre-characteristics.—From authors' abstract.

1306 GOODHUE, L. and OSBORN, C. **Defoliant 713.** *Agric. Chem.* 1956, **11,** No. 5, 32–4 and 127. [Phillips Petroleum Co., Bartlesville, Oklahoma]

The results are given of field trials with a new defoliant for cotton. Defoliant 713 appears to be a mixture consisting mainly of di (ethylxanthogen) trisulphide. It is the first chemical that combines rapid desiccation of cotton with good defoliation properties. The material acts rapidly and is quickly absorbed by leaves, but sunlight is needed for its most effective action. It is not translocated within the plant. Given good coverage, applications of 2–3 lb. active ingredient per ac. have resulted in about 75% defoliation, with desiccation of the remaining leaves. Defoliant 713 is not reported to harm cotton bolls and does not cause them to remain closed, as do a number of other desiccants. —P.J.B.

1307 BALTAZAR, E. P. **The future of cotton in the Philippines.** *Philipp. J. Agric.* 1954, **19,** No. 1–2, 19–29, bibl. 11, illus.

Notes are given on the cultivation of cotton in the Philippines. Of varieties used, the Batangas White variety of *Gossypium paniculatum* appears to be the most promising, but the need for its improvement by breeding is stressed.—P.J.B.

1308 RODRIGUEZ, J. P. and others. **Cotton variety trials in Puerto Rico.** *J. Agric. Univ. P.R.* 1956, **40,** No. 1, 49–61, bibl. 6. [Agric. Exp. Sta., Univ. Puerto Rico]

Yield and fibre quality of the varieties Montserrat Sea Island, Coastland Sea Island, Sealand, Pima 32 and Amsak, were compared, following trials at a number of locations in Puerto Rico. Sealand was found to be a productive variety with a low quality fibre which it was suggested might be used for production of cotton at low cost. Montserrat Sea Island gave good yields of high quality fibre.—G.M.W.

1309 WALHOOD, V. T. **A method of reducing the hard seed problem in cotton.** *Agron. J.* 1956, **48,** No. 3, 141–2, bibl. 2. [Bot. Dep., Univ. California, Los Angeles]

Both rate, and final percentage, of germination were greatly increased by immersing in tap water at 85°C. for 1 min. seeds of the following 3 species of cotton : (1) *Gossypium thurberi*, a hard seeded wild species ; *G. barbadense* var. Pima S-1, a commercial variety in which the hard seed problem is intermediate ; and *G. hirsutum*, Acala 4–42, a commercial variety in which hard seed is not a problem. The treatment is effective up to at least 2 months following treatment. The results suggest a rapid removal of a water-soluble germination inhibitor, and/or the destruction of a heat unstable inhibitor, whose presence completely inhibits or retards germination.—P.M.G.

1310 RÍOS, P. and MONTILLA, J. A. Ensayos preliminares con herbicidas en algodón. [**Preliminary trials of herbicides on cotton.**] *Agron. trop., Maracay* 1955, **4,** No. 4, 215–23, illus., English summary. [Esta. Exp. Serv. Shell, Cagua, Aragua, Venezuela]

1311 WATSON, A. J. **Controlling established Johnson grass in cotton by spot treating with Dalapon.** *Down to Earth* 1955, **11,** No. 3, bibl. 4, illus. [Dow Chem. Co., Greenville, Mississippi]

Johnson grass [*Sorghum halepense*] is a serious weed of cotton and its control is often a major cost. Spot treating with Dalapon, avoiding the cotton, is best for fields with moderate, scattered infestations. 85% Dalapon was applied at 0·17–0·5 lb./gal., 8–10 gal./ac. being applied first, and 3–5 gal. later, using a knapsack sprayer. 0·33 lb./gal. was adequate and proved best applied thrice and at 3 week intervals, when the plants were 6–8 in. tall. The plants should be left intact after spraying to ensure root kill.—J.F.C.

1312 EVERSON, E. H. and ARLE, H. F. **The effect of the application of varying rates of CMU at different stages of plant growth and fiber development on the yield and fiber quality of irrigated upland cotton.** *Weeds* 1956, **4,** No. 2, 148–55, bibl. 9. [Univ. Arizona Exp. Fm, Mesa]

Single applications of CMU were given on 6 separate dates and at rates of 0·5, 1, 2 and 4 lb./acre, applied as a spray direct to the soil and followed by irrigation. The higher rates caused chlorosis, stunting and even death of young cotton plants,

but the older plants were much less affected owing to their deeper root systems. Early applications, except at the 0·5 lb. rate, controlled the weeds effectively for a while, but not later. The 4 lb. rate, usually, and the 2 lb. rate, sometimes, reduced yields. The 2 lb. and lower rates did not affect the weight of boll, % lint, or fibre length, strength and fineness, but the 4 lb. rate did, unless applied after the initial development-stage of the fibre.—J.F.C.

1313† SWEZEY, A. W. **Baron presents low drift hazard.** *Down to Earth* 1955, **11,** No. 3, 10–11, illus. [Dow Chem. Co., Seal Beach, California]

Baron, containing 4 lb./gal. of Erbon (2,(2,4, 5-trichlorophenoxy)-ethyl 2,2, dichloropropionate) can control both grasses and broad-leaved weeds. Growth-malformation was not usually noted beyond the line of spray when it was applied to susceptible weeds, using a power-rig with boom. Cotton 15–18 in. tall was treated with Baron at Erbon-equivalents of 0·25–4 lb./ac., and with 2,4,5-T amine at 0·01–0·50 lb./ac., each in 35 gal. There was no injury up to 1 lb./ac., but at 4 lb., shortening and mild leaf-malformation occurred. Four lb. of Erbon are approx. equal to 0·1 lb. of the amine.—J.F.C.

1314 MOSTAFA, M. A. and NAIM, M. S. **Physiological significance of resistance and susceptibility—to Fusarium wilt—of some Egyptian cotton varieties. 1. Effect of root metabolites on mycelial growth and conidial germination.** *Bull. Inst. Desert Egypte* 1955, **5,** No. 1, 82–98, bibl. 14.

The work was carried out with the cotton varieties Giza 26, susceptible to wilt, and Karnak, relatively resistant to *Fusarium solani*.—M.P.

1315 COURY, T. and others. Contribuição ao estudo do "vermelhão" do algodoeiro (*Gossypium herbaceum*). [**A contribution to the study of the "reddening" disease of cotton** (***Gossypium herbaceum***).] *An. Esc. Agric., Queiroz* 1954, **11,** 41–68, bibl. 49, English summary. [Univ. São Paulo, Brazil] [Received June, 1956]

A disease of cotton characterized by a red-purple colour of the leaves, which occurred in São Paulo State in 1948–51, was shown to have been caused by Mg deficiency and, to a lesser degree, by K deficiency. It can be easily controlled by the application of either magnesium sulphate or dolomitic limestone.—From authors' summary.

1316 KAZIEV, T. [**The role of bees in pollinating cotton.**] [Russian] *Hlopkovodstvo* (*Cott. Prod.*) 1955, **5,** No. 12, 39–40. [Bot. Dep., Kirovabad Pedagogic Inst.]

The author's studies [in Azerbaĭdžan] have shown that bees collect both pollen and nectar from the flowers of *Gossypium* sp. The collection of pollen by the bees takes place between 8 a.m. and 4 p.m. with the most intensive activity between 10 a.m. and 2 p.m. Tests on the effect of pollination by bees on cotton harvests and on the quality of crude cotton are outlined. Plots of 6 sq. m., each containing 48–50 plants of different cotton varieties were covered with gauze to prevent pollination by insects; similar plots, uncovered, comprised the controls. Observations (during 2 years) were made from the beginning of flowering to boll ripening. There is evidence that the number of embryos was increased in the plants to which bees and insects had access, the increase varying, in different varieties, between 12 and 19%. There is also evidence that the number of ripening bolls from plants pollinated by bees was greater than from the covered plants, this increase varying, according to variety, between 12% and 22·5%. It is claimed that cross pollination effected by bees improves the lint quality (strength) in all varieties [no details given].—M.H.

1317 DE MEESTER, J. Premiers essais de bouturage du cotonnier à la Station de Bambesa. [**First trials in propagating cotton by cuttings at the Bambesa Station (Belgian Congo).**] *Bull. agric. Congo belge* 1955, **46,** No. 6, 1367–84, illus. [Sta. Rech. Agron. INÉAC, Bambesa, Belgian Congo]

1318 DASTUR, R. H. and BHATT, J. G. **Study of the effect of chemical hormones on the carbohydrate and nitrogen contents of the cotton plant.** *Indian Cott. Gr. Rev.* 1956, **10,** No. 1, 42–56, bibl. 18. illus. [Cott. Physiol. Res. Scheme, Indore]

The effects of 2-3-5 tri-iodobenzoic acid, α-naphthalene acetic acid and α-3-indolyl-butyric acid on the carbohydrate- and nitrogen-contents of different parts of the cotton plant and on their dry weights were investigated. —P.M.G.

1319† CHANG, C. W. and DREGNE, H. E. **Effect of exchangeable sodium on soil properties and on growth and cation content of alfalfa and cotton.** *Soil Sci.* 1955, **19,** No. 1, 29–35, bibl. 19, illus. [New Mexico Agric. Exp. Sta., State Coll, New Mex.]

Lucerne and cotton were grown in a greenhouse on Gila clay loam treated with Na_2CO_3 to obtain increasing levels of exchangeable Na. Reduced yields were noticeable at about the 35% level of Na saturation. Treatment of the soil with the conditioner VAMA (0·2 g. vinyl acetate maleic acid/100 g. soil) increased the growth of lucerne, but not of cotton, at Na levels which were detrimental on unconditioned soils. The critical level

of Na-effect was considered to depend on soil condition, management and on species and variety of crop. The decreased yields were associated with an increase in Na content and a reciprocal decrease in Ca content in the plant. "Sodium-induced Ca deficiency" was shown by reddish coloration on lower leaves, followed by collapse of petioles.—J.F.C.

1320 EMPIRE COTTON GROWING CORPORATION. **Progress reports from experiment stations, season 1954-55. Kenya.** London, 1956, pp. 13.

INVESTIGATIONS REPORTED :

1. Thinning experiment, Kibos, pp. 3–4. Neither the date of thinning nor the number of plants left per hole had any significant effect upon the yield of seed cotton.
2. Date-of-sowing experiment, p. 4. Sowing before, and early in, the rains resulted in larger yields of seed cotton than sowing after the main rains. Plots sown early in March gave the highest significant yields.
3. Variety trials, pp. 4–5. Uk 53 gave the best performance ; S47 matured earlier than the Ukiriguru varieties.
4. Manuring and cultivation trials, pp. 5–6. At all 3 sites, mulch caused yellowing of the foliage and yields were depressed below those from the control plots. Ten tons of manure per ac. increased yields. There were no marked differences between flat, tie-ridged, or benched-and-tied cultivations. At Bungoma, significant responses were obtained to P and cattle manure but not to N.
5. Field trials, pp. 12–13. The value of early spraying of the cotton crop, with 1 lb. DDT and 0·3 lb. BHC as a high-volume spray at 10 day intervals, against insect pests was noted. At Kibos, a dust containing 3% gamma BHC and 10% DDT at 20 lb. per ac. was superior to the high volume spray mentioned above.—M.P.

1321 EMPIRE COTTON GROWING CORPORATION. **Progress reports from experiment stations, season 1954-55. Northern Nigeria.** London, 1956, pp. 23, illus.

INVESTIGATIONS REPORTED :

1. District variety tests, pp. 6–9. Seven reselections of Samaru 26C showed some advance over the control bulk-stock of 26C, line 479–25 being of particular value as a successor to 26C because of its higher seed-cotton yields, earlier cropping and better spinning quality. Type 26I/25 gave the highest yield of lint.
2. Control of bacterial blight by seed disinfection, pp. 12–14. Treatment with Agrosan was more effective than treatment with sulphuric acid in giving protection against bacterial blight. The two treatments applied together resulted in higher plant-stand numbers, and in significantly improved seedling appearance, but yields were not markedly affected. Delinted seed had a better start than raw seed, this was most noticeable in the first picking, irrespective of any other seed treatment.
3. Agronomic experiments, pp. 14–15. The advantages of sowing early, in the first week of July, at a spacing of 18 in. × 36 in., with 2 plants per stand, noticed in the previous year, were again confirmed.
4. Insecticide trials, pp. 19–23. Previous results were confirmed. The trials at Kontagora demonstrated that high yields resulted from the use of insecticides when the cotton was grown under optimum conditions of fertility, spacing and sowing.—M.P.

1322 GREEN, J. M. **Border effects in cotton variety tests.** *Agron. J.* 1956, **48,** No. 3, 116–18, bibl. 5. [Oklahoma Agric. Exp. Sta.]

In 3-year trials at 3 dry-land locations in Oklahoma, significant or highly significant differences in yield of 2 test varieties resulted from border effects in 4 of the 9 tests. Differences in yield of the 2 varieties averaged over all borders were highly significant in 5 of the 9 tests. No significant border × variety interaction indicated similar reaction of test varieties to borders. On the basis of these results, Oklahoma variety tests are planted with 4-row plots, the inner two being harvested for yield.—From author's synopsis.

FLAX

1323 BURROWS, V. D. and OLSON, P. J. **Reaction of small grains to various densities of wild mustard and the results obtained after their removal with 2,4-D or by hand. 2. Experiments with flax.** *Canad. J. agric. Sci.* 1955, **35,** No. 2, 193–200, bibl. 10. [Div. Pl. Sci., Univ. Manitoba, Winnipeg]

Flax sown at 45 lb./ac. was grown alone and with various densities of wild mustard (*Brassica arvensis*). Some of the plots were sprayed with 2,4-D butyl ester at 3 and 4 oz./ac. when the flax was 1–1·5 in. high in 1952, and 2–3 in. high in 1953. It was found that spraying when the density was 10 or more mustard plants per sq. yd. increased the yield of flax seed significantly, and that the presence of mustard at the seedling stage of flax affected adversely its basal branching, even when the weed was killed soon after by 2,4-D. In 1952, the reduction in basal branching on sprayed plots increased with the density of mustard and gave similar reductions in seed-bolls per plant, and in weight of straw and seed. In 1953, the flax outgrew the effect of early reduction in basal branching, which was compensated by top branching. It was shown that competition from weeds during the early stages of the growth of flax is important,

and that spraying should be done as early in the growing season as possible. The use of 2,4-D was found to be justified even at a density of 10 mustard plants per sq. yd.—J.F.C.

1324 STOA, T. E. and others. **Foxtail—how does it affect yields and nutritional needs of flax?** *Bi-mon. Bull. N. Dak. agric. Exp. Sta.* 1955, **17,** No. 5, 163–6, illus.

For 6 years, flax and foxtail (*Setaria* spp.) were grown separately at 35 lb. per acre and in a mixture of 35 lb. each per acre. Four trials were located at Fargo on heavy clay soil, one at Park River and one at Minot [soil types not stated]. Yields were recorded, and analyses were made of the chemical content of both straw and seed of both plants for N, P, K, Ca, Mg and S. Some abnormal yield results were obtained from the mixtures in 2 years when weather conditions were very favourable either to flax or foxtail growth. Flax alone yielded an average of 19·1 bu. and flax grown with foxtail, 11·8 bu. Analyses showed that flax seed was higher than foxtail seed in all elements, except K where they were equal. From the calculations of nutrients removed from the soil the mixture exceeded the flax alone only in K and Mg. The influence of weed-infestation was shown to decrease yield, but not to be especially exhaustive of soil fertility.—G.M.W.

1325 HANNAH, A. E. and CUNNINGHAM, R. H. **A portable boll stripper for harvesting individual flax plants.** *Canad. J. agric. Sci.* 1956, **36,** No. 2, 144–5, bibl. 1, illus. [Canada Dep. Agric., Winnipeg, Manitoba]

This small boll-stripper has been designed for stripping and bagging the bolls from selected single flax plants in the field thus eliminating the mixing of seeds from different plants.—G.M.W.

JUTE

1326 KUNDU, B. C. **Jute—world's foremost bast fibre. 1. Botany, agronomy, diseases and pests.** *Econ. Bot.* 1956, **10,** No. 2, 103–33, illus. [Jute Agric. Res. Inst., Barrackpore, India]

A summary is given of information on the botany, agronomy, pests and diseases of *Corchorus capsularis* and *C. olitorius*, as grown in India and Pakistan. Details are given of varieties of both species in cultivation.—P.J.B.

KENAF

1327 CRUZ, E. E. **Kenaf in the Philippines with particular reference to culture in Davao.** *Philipp. J. Agric.* 1954, **19,** No. 1–2, 105–17, bibl. 9, illus.

Practical recommendations are given for the cultivation of kenaf (*Hibiscus cannabinus*) in the Philippines. Of a number of introduced varieties grown for seed in 1952 at Davao City, the highest yields were given by IX–114, IX–138 and Indian in that order.—P.J.B.

OIL CROPS

SESAME

1328 COLLISTER, E. H. **Improvement of sesame** *Bull. 4. Hoblitzelle agric. Lab., Texas Res Found.* 1955, pp. 37, bibl. 29, illus.

A general description of *Sesamum indicum* is given including its morphology, chemistry, cultivation regions and insect pests and diseases. The main limitation to its cultivation has been the severe seed loss through pod-shattering. Sowing in N. and C. Texas should be in the first half of May, in rows, at 1 lb./ac. (plants 1 in. apart). Special attachments are required for satisfactory combine harvesting. Satisfactory threshing of the thick, tightly-closed pods with conventional combine harvesters cannot be expected. Only slight superficial damage to the seed can cause failure of germination or unsuitability for processing. Several methods of harvesting dehiscent sesame have been evaluated. The grain- or row-binder method of harvesting has been the most consistently successful over 4 years. The plants are cut and bundled when all the leaves have dropped; this is followed by shocking, tying string around the centre shock, and combining from the shock after 10–14 days drying. Using a platform attachment on the front of the combine, up to 95% of the seed is recovered.—J.F.C.

RAPE

1329 BUNTING, E. S. **Winter rape as an oil seed crop.** *Agriculture, Lond.* 1956, **63,** No. 1 17–20. [A.R.C. Unit of Exp. Agron., Dep Agric., Oxford]

The supposed superiority of spring- over winter rape in Britain is reviewed. The relation of sowing date to winter survival and yield of continental winter rape [*Brassica napus* var. *oleifera* subvar. *biennis*] and winter turnip-rape [*Brassica campestris* var. *oleifera* subvar. *biennis*] varieties was tested. Plants sown in September, to compare early with late, showed little winter-growth, started later in spring and gave a much lower yield. No winter mortality occurred, even in 1954. Essex Dwarf proved to be much inferior to the better continental varieties in oil-production. When sowing 6–8 lb./ac. in drills 16–18 in. apart is recommended, but closer spacing would be better

in the absence of weeds. High Ca is needed and the heavier types of soils are preferred. 60–70 lb. N/ac. gives a good response. Owing to the long flowering-period, loss of seed is liable to occur. The crop should therefore be cut and windrowed before fully ripe. An extension of winter-rape production is required because of its superiority to spring rape in oil production.—J.F.C.

1330 COLLIN, J.-L. Productivité de la culture du colza en France. [**Productivity of colza in France.**] *Oléagineux* 1956, **11,** No. 6, 387–91, map.

The information given includes data of crop areas, total production and yields per unit area. It is considered that there are great possibilities for the future development of colza in France. [See also Abs. 916.]—E.B.O.

1331 HELLSTRÖM, N. **Investigations on oil turnips and oil rape. 3. A survey of starch content in connection with [cold] hardening.** *Acta agric. scand.* 1954/5, **5,** No. 1, 22–30, bibl. 9. [Organ. Chem. Inst., Roy. Agric. Coll., Uppsala, Sweden]

The results are presented of determinations of the starch content of 2 varieties of turnip rape [*Brassica campestris* var. *oleifera*] and 2 of rape [*B. napus* var. *oleifera*], following cold-hardening treatment. Comparisons were made between cold-hardened and untreated plants, based on analyses of the residues after fat extraction and extraction with dilute ethanol. The results showed that the process of cold-hardening in all varieties was associated with a fall in starch content, which amounted to a loss of over 80% of the total starch in some cases. Losses in starch content were accompanied by rises in total-sugar content, but there was evidence that starch was not quantitatively transformed into simple carbohydrates. It was thought likely that certain cell-wall constituents, such as pectin, cellulose and hemicellulose were also involved in the hardening process. [See also *Fld Crop Abstr.* 8 : 1393 and 1394.]—P.J.B.

1332 TORSSELL, B. and HELLSTRÖM, N. **Investigations on oil turnips and oil rape. 4. Estimation of plant status.** *Acta agric. scand.* 1954/5, **5,** No. 1, 31–8, bibl. 12, illus. [Organ. Chem. Inst., Roy Agric. Coll., Uppsala, Sweden]

A study was made of methods for evaluating the viability of the tissues of winter rape [*Brassica napus* var. *oleifera*] plants, following their subjection to freezing treatments. In studies, using cold-hardened plants and 2,3,5-triphenyltetrazolium chloride as an indicator, the estimated minimum lethal temperature for the pith was —8·8°C., for the roots —9.9°C., and for the vascular tissue in the stem —11·4°C. With the material used, the reaction of the vascular tissues in the stems appeared to be more closely related to the capacity of the plants for regeneration after freezing than did the reaction of other parts of the plants. A combination of 2,3,5-triphenyltetrazolium chloride and indigo carmine made it possible to distinguish between living tissue, tissue dead but infected with bacteria, and tissue dead but not infected. Tetrazolium salt staining, alone, did not give reliable results with infected tissues.—P.J.B.

1333 HELLSTRÖM, N. and TORSSEL, B. **Investigations on oil turnips and oil rape. 5. On the rate of hardening.** *Acta agric. scand.* 1954/5, **5,** No. 1, 39-43, bibl. 4. [Organ. Chem. Inst., Roy. Agric. Coll., Uppsala, Sweden]

Plants of Matador winter rape [*Brassica napus* var. *oleifera*] were cold-hardened at temperatures of 3–5°C. for up to 16 days. After different periods of cold-hardening treatment, they were analysed chemically and also subjected to freezing treatments at —5, —7, —9, —11 and —13°C. During the cold-hardening treatments, the amount of residue after extraction with dilute ethanol and the amount of starch decreased, while the amount of total sugars increased at about the same rate as the residue and starch contents decreased. After about 4 days of hardening treatment, the values of these 3 components reached a relatively constant state. Freezing tests showed that cold resistance increased as cold-hardening treatments were prolonged up to about 4 days. The temperature limit was approximately —10·7°C.—P.J.B.

1334 KASAI, Z. and OKUDA, A. **On translocation of mineral nutrients in higher plants. Pt 3. Influence of photoperiodic treatment on distribution of phosphorus absorbed in young rape [*Brassica napus*] plant.** [Japanese] *J. Sci. Soil, Tokyo* 1956, **26,** No. 10, 423–6, bibl. 1, English summary. [Kyoto Univ., Japan]

EUPHORBIA LATHYRUS

1335 MAZZANI, B. Introducción de plantas oleaginosas nuevas para Venezuela. 3. *Euphorbia lathyrus* L. [**Introduction of oil plants new for Venezuela. 3. *Euphorbia lathyrus.***] *Agron. trop., Maracay* 1955, **4,** No. 4, 225–31, bibl. 3, illus. [Cent. Invest. Agron., Maracay, Venezuela]

A botanical description and the characteristics are given of *Euphorbia lathyrus*, an annual, considered suitable for cultivation in arid regions. A small sample of its seed was introduced in 1953 from Palestine into Venezuela where the plant is now under study. The oil content of the seed was found to be 40·5% and that of the kernel 58·2%,

the composition of the oil being similar to that of olive oil. The following observations were recorded: (a) *E. lathyrus* is intolerant of high soil-moisture and high air-humidity ; (b) its erect habit makes it suitable for mechanized cultivation ; (c) as the fruit dries on the plant with no shedding, harvesting and threshing can take place simultaneously ; (d) a disadvantage is the late formation of latera branches which starts 8–10 weeks after sowing the period of flowering and seed setting is thus delayed, the vegetative period being 120-14(days. It is considered possible to select types with no lateral branches, or a limited number of them.—E.B.O.

LAND USE, SURVEYS AND MANAGEMENT

1336† Burvill, G. H. **Salt land survey, 1955.** *J. Dep. Agric. W. Aust.* 1956, **5,** No. 1, 113–19, illus.

A survey was carried out in 1955 to assess the salt problem on farms in Western Australia. The survey took the form of a questionnaire sent to 10,576 farmers whose holdings covered 27 million ac. Only 835 farmers considered salt encroachment as a major problem.—M.P.

1337 Hart, J. **The agricultural potential of the Central Queensland Highlands.** *Qd agric. J.* 1955, **81,** Pt. 4, 187–201.

The climate, rainfall and soil types of the Central Queensland Highlands are compared with those of the Darling Downs where, in the last 20 years, great agricultural progress has been made. The advent of mechanized farming has enhanced the potential of the Central Highlands, and the activities of the Queensland British Food Corporation have popularized agriculture in the area. The ideal farming programme contemplated is based on maximum moisture conservation by contour strip-cropping, with a grass/fallow/crop rotation. Owing to high temperatures and erratic, though good, rainfall, storage of moisture in the soil is essential. A stubble-mulch fallow is recommended for reducing evaporation and soil erosion. Summer crops, and winter crops especially, should be sown only where adequate moisture has been stored in the soil. Sorghum, by its ability to ratoon freely, has proved outstanding as a dual-purpose crop fo grain and grazing. Sweet sorghum and winte oats are also useful sources of fodder in winter and spring. Linseed and sunflower do well in the area but maize and cotton show little promise. Wheat and grain sorghum yields as high as 60 bu. per ac can be obtained with correct land management.—M.P.

1338† Agronomie Tropicale, Nogent. Enquête agro-économique pilote sur l'utilisation des terres de la subdivision de Kaélé (Cameroun). [**A pilot agronomic-economic survey of land utilization in Kaélé (French North Cameroons).**] *Agron. trop., Nogent* 1955, **10,** No. 5, 582–91, English summary.

The results from this survey, carried out by the spot-checking method, are summarized thus : food crops 20·6%, industrial crops (cotton and groundnuts) 4·5%, bush 72·1%, waste land 2·8%, of the total area. The degree of precision of these figures has been calculated.—E.B.O.

1339 Beckett, W. H. and Anyane, S. L. **Agricultural surveys with particular reference to tropical forest conditions.** *Trop. Agric., Trin.* 1956, **33,** No. 2, 101–12, bibl. 7. [Gold Coast Dep. Agric.]

The purpose and nature of surveys, giving examples, principles, observations, and definitions of the technical terms used, are discussed.—P.M.G.

FARMING SYSTEMS AND PRACTICES

1340 Könnecke, G. Die Bedeutung der Vorfruchtwerte bei der Aufstellung von Fruchtfolgen. [**The importance of the preceding crop when organizing crop rotations.**] *Z. Acker- u. Pflbau* 1956, **101,** No. 1/2, 171–82. [Martin-Luther Univ., Halle-Wittenberg, E. Germany]

1341† Gardner R. and Robertson, D. W. **The beneficial effects from alfalfa in a crop rotation.** *Tech. Bull. 51. Colorado agric. Exp. Sta.* 1954, pp. 26, bibl. 15.

Two field experiments were laid down in 1935 and '37. In the first, comparisons were made of the yields of non-legumes grown in either a 5-course rotation containing no legumes, or in an 8-course rotation, using the same sequence of non-legume crops, with the addition of 3-years' lucerne. In the second experiment, an 8-course rotation, similar to the previous one, was used and included 3-years' lucerne, grass, or lucerne/grass mixtures. These rotations were also combined with different N or P treatments. Where no manures were applied, yields of maize and sugar-beet declined markedly

in the rotation with no legume, but remained relatively constant where a legume was included. Yields of wheat and barley remained relatively constant with no legume in the rotation, but increased significantly where lucerne was included. In general, the lucerne contributed materially to the available soil N supplies in the 8-year rotation. P was a limiting factor for all crops in both rotations. Lucerne significantly increased the nitrate N in the soil, but not the total soil N. The difference in the total amount of N in 5 crops following lucerne and in the same crops where no lucerne preceded them in the rotation was 158 lb. per ac. Of this amount, 40 lb. per ac. was estimated to have originated from hay returned to the soil once in 5 years, and 118 lb. originated from roots, stubble and other residues. The 8- and 5-year rotations gave approximately equal yields where N + P was applied. It was concluded that the major effect of lucerne in increasing crop yields was due to the increase in available N it brought about. The effect of lucerne on available soil P was relatively small.—P.J.B.

1342 DUBETZ, S. and others. **Crop sequence studies on irrigated land in southern Alberta.** *Canad. J. agric. Sci.* 1955, **35,** No. 6, 564–7, bibl. 9. [Canada Dep. Agric., Lethbridge, Alberta]

Each of the following crops was included in a crop-sequence experiment under irrigation, and each crop was grown after itself, after summer-fallow and after the others : canning peas, canning maize, potatoes, barley, soft spring wheat, sugar-beet and field beans. Oats were sown in the fourth year and then the cycle was repeated. Beans proved the best preceding crop, and then potatoes and peas ; barley and sugar-beet proved the worst. There were no significant differences in yield of wheat and maize after the various other crops. The greatest yield-reduction occurred in potatoes after potatoes. Plots which had previously grown peas had the highest weed-infestation, and those which had grown intertilled crops the least. Summer-fallowing of irrigated land was found to be economically unjustified.—J.F.C.

1343† HOBBS, J. A. **The effect of crop rotations and soil treatments on soil productivity.** *Soil Sci.* 1955, **19,** No. 3, 320–4. [Dep. Agron., Kansas Agric. Exp. Sta., Manhattan]

Owing to loss in fertility of cultivated soils in Kansas, studies were initiated in 1909 to determine long-term effects of crop rotation and soil treatments on soil productivity. The cropping systems comprised : a 16-year rotation consisting of 12 years of grain and 4 of lucerne, a 3-year rotation of maize/annual legume(hay)/wheat, continuous wheat, continuous maize and continuous lucerne. The trends in productivity over 42 years are analysed. Yields of unfertilized wheat (improved vars.) and maize were maintained only in the 16-year rotation. All other crop yields decreased with time, although there were wide fluctuations and results were not always statistically significant. It was found possible to increase grain productivity by applying complete fertilizer or manure. It appeared that the use of fertilizer on grain could overcome the detrimental effects of a poor cropping system. Although P and K increased the yield of lucerne, they increased the rate of decline in yield. The decline in lucerne yield, alone or in rotation with grain, was ascribed to its exhaustive and deep use of soil water.—J.F.C.

1344† POTTER, L. D. **Yearly soil temperatures in eastern North Dakota.** *Ecology* 1956, **37,** No. 1, 62–70, bibl. 13, illus. [Bot. Dep. N. Dakota Agric. Coll., Fargo]

The effect of crop practices and vegetation cover on heat penetration of soil, maximum and minimum temperatures, frost duration, thawing, and frost-free period ; the effect of snow cover on soil temperatures ; and the yearly fluctuations in temperature were studied at soil depths ranging from 1 in. to 6 ft. at 5 different sites at Fargo, during 1952–4. The insulating effect of snow cover, and, to a greater extent, of a *Poa pratensis* lawn sod was noticeable. The greatest lag of heat penetration and loss was observed under a maize crop where temperature changes occurred 1·5–2 months after those on ploughed fields, under a wheat mulch or a grass sod. The results are discussed in relation to their practical application.—M.P.

1345 ANTHONY, K. R. M. and WILLIMOTT, S. G. **A study of soil fertility in Zandeland.** *Emp. J. exp. Agric.* 1956, **24,** No. 93, 75–88, bibl. 4. [Yambio Exp. Fm, Minist. Agric., Republ. Sudan]

The results from a study of soil fertility carried out from 1949–55 at the Yambio Experimental Farm are reported and are considered in comparison with the results from peasant practice. Although, in general, lateritic soils are of low nutrient status, they are nevertheless capable of considerable cropping capacity when rightly managed. The data for groundnuts and eleusine indicate that economic yields are no longer produced after 3–4 years and so provide a clear vindication of the local practice of bush fallowing after 2–3 years' cropping. Cotton was shown to be more resistant than other crops to low-fertility soil conditions. The soil data obtained in this study strongly discount the possibility that this decline in yield is caused by exhaustion of soil N. After 2 years' cropping, bush regeneration on the fallows was rapid and grass species were quickly suppressed. *Imperata cylindrica* dominated the fallow in the early years and after 4 years' cultivation regeneration of woody species can be expected to be slow.—From authors' summary.

1346 BAKER, L. O. and others. **Chemical summer fallow in Montana.** *Down to Earth* 1956, **11,** No. 4, 21–3, bibl. 3. [Montana Agric. Exp. Br. Sta.]

Where weed-control was good, wheat yields on chemical fallows (land treated with herbicides) have equalled or exceeded those on tilled fallows, but production was more costly. With chemicals and tillage combined, the cost is usually reduced. Soil compaction on untilled land may reduce the stand, but only one sub-surface tilling is usually needed to make a seed-bed. TCA has a residual effect on winter wheat, but not on spring wheat sown 9–11 months after application. Chemical fallow without tilling effectively resisted wind- and water-erosion.—J.F.C.

1347† SILLANS, R. Les défrichements culturaux et la savanisation de l'Oubangui-Chari. [**The clearing of land for cultivation and the formation of savannahs in the Ubangi-Shari.**] *J. Agric. trop. et Bot. appl.* 1955, **2,** No. 7–9, 431–2.

The cultivation methods of the natives are considered to be the primary cause of the formation of savannahs in the Ubangi-Shari ; bush fires are of secondary importance.—E.B.O.

1348 PRUITT, W. O. and JENSEN, M. C. **Determining when to irrigate.** *Agric. Engng, St. Joseph, Mich.* 1955, **36,** No. 6, 389–93, bibl. 12, illus. [Irrig. Exp. Sta., Prosser, Washington]

The actual consumptive-use of four crops, viz. sugar-beet, lucerne and early and late potatoes, has been compared with tank evaporation and with estimated consumptive-use computed by the Thornthwaite and the Blaney-Criddle procedures. During periods of good crop cover, tank-evaporation rates gave a closer estimate of actual consumptive-use rates than the other methods, and may prove applicable in determining when to irrigate.—G.M.W.

1349 BROUWER, W. and KARTIN, K. H. Ein Beitrag zur Frage Beregnung und Düngung. [**On spray irrigation and manuring.**] *Z. Acker- u. Pflbau* 1956, **101,** No. 1/2, 79–94, bibl. 12, [Landw. Hochsch. Hohenheim, Stuttgart, W. Germany]

The best growth-stages for spray irrigating certain crops were determined. These were : for winter rye, wheat, and barley, about flowering time ; for oats and spring barley, from heading to beginning of flowering ; for potatoes, about beginning of flowering ; and for sugar-beet, from July to the end of August. A small quantity of supplementary fertilizer at the rate of 10, 10 and 15 kg./ha., respectively, of N, P_2O_5 and K_2O applied on th same day as spraying gave worthwhile increase in yield.—D.B.

1350 HAGENZIEKER, F. **Studies on subsoil place ment of fertilizer at Urambo, Tanganyik Territory.** *Emp. J. exp. Agric.* 1956, 24 No. 94, 109–20, bibl. 6, illus. [Univ. Coll Gold Coast]

Analyses of the depth-distribution of the mos important plant nutrients in the soil, in connexio with a study of root development of crops on th main soil types in the Urambo area, have led t conclusions which may necessitate a radical chang in the method of application of P fertilizers in tha area. In all the soil types, P and Ca, but not Mg o K, were concentrated in the top 6–8 in. of soi The accumulation of P in the top soil was greate in the grey sands than in the red, sandy loams Root development differed greatly in these soi types. It appeared likely that differences in dept of rooting in soyabeans were due to the differen distribution of P between top soil and subsoil in th sands as compared with the loams. Field experi ments were carried out on Urambo grey sands t test the hypothesis that a better response to P ma be expected through placing the fertilizer in th subsoil. Yields of soyabean were increased 80% above the unfertilized controls, when 1·33 cwt superphosphate per ac. was placed 12 in. belo the soil surface. Similarly, maize yields were in creased 45%. No responses were recorded if th same dressing was either broadcast or drilled a sowing time in 2 side-bands on either side of th seed-row.—From author's summary.

1351 VOGL, H. Der Erdwürfelanbau als zweit Ernte. [**The " earth-cube " crop for th second harvest.**] *Dtsch. landw. Pr.* 1956, 7 No. 16, 152, bibl. 1, illus. [Landwirt schaftsamt, Deggendorf, Bavaria, W. Ger many]

The " earth cube" method of cultivation has bee under test in Deggendorf since 1950, and by 195 (a cold, wet summer) it was already used wit satisfactory results over a wide area especially i climatically unfavourable parts of the Bavaria Forest up to an altitude of 850 m. The earth cube consist of 40% compost, 40% clay soil and 20% peat. Pressing is not required. The seed is sow in the earth cube. When the plant is about 20 cm high it is transplanted along with its earth, an growth continues undisturbed. Thus a second cro can begin its growth 6–8 weeks before harvestin the first crop, and by this means crops such a grain maize, sugar- and fodder-beet and sunflowe which normally occupy a full growing season, ca be harvested as a second crop. The advantage o the method is illustrated by the cultivation o

odder- and sugar-beet. Since the vegetative growth overshadows the ground in 3–4 weeks, veed growth is checked. The beets were not ttacked by *Cercospora*, thus spraying was not ecessary. The yields of tops, roots and sugar were higher than by the normal method of cultivation. The method absorbed 16·8 working days per ha. against 17·9 working days by the drilling method. Monogerm seed was used ; a smaller quantity was required than for drilling.—D.B.

SOIL AND WATER CONSERVATION

352 ARGIKAR, G. P. **Some experiments with hoe scooping, the easy way of conserving rain water in arid regions.** *Poona agric. Coll. Mag.* 1955, **46,** No. 2 and 3, 117–21, illus.

The method of scooping out hollows on bare fields before the onset of the rains is outlined. Results from trials on different soils with a pulse, a millet and another cereal grown as monsoon- and winter-crops indicated the value of this means of moisture conservation in arid zones.—M.P.

353† PEREIRA, H. C. **Soil water storage under catchment area vegetation.** *Trans. 5th. internat. Congr. Soil Sci. Leopoldville* 1954, **3,** 455–9, bibl. 9. [E.A.A.F.R.O., Muguga, Kenya] [Received Feb., 1956]

The role of vegetation in the hydrological cycle must be studied in pilot experiments before any major changes in the land use of catchment areas can be started, particularly as regards the substitution of indigenous forest by timber plantations, permanent pastures or field crops in areas of high potential value. The use of field measurements of soil-moisture storage changes as an alternative to lysimeter studies in East Africa is discussed.—M.P.

354 STAPLE, W. J. and LEHANE, J. J. **The influence of field shelterbelts on wind velocity, evaporation, soil moisture and crop yield.** *Canad. J. agric. Sci.* 1955, **35,** No. 5, 440–53, bibl. 9. [Soil Res. Lab., Swift Current, Saskatchewan]

Severe crop losses due to drought and soil-drift occurred in the Canadian Prairies during 1930–40 and led to the introduction of shelterbelts. These belts and hedge-rows were found to reduce the velocity of winds to a distance of at least 20 times the height of the trees. The hazard of soil-drift was thus reduced. Reduction in evaporation near the belts was slight and unlikely to have had a measurable effect on the conservation of soil moisture or on wheat yield. The accumulation of snow near the belts varied from zero to 70 ft.–wide drifts, which increased the local soil moisture at seeding time, and so caused greater yields (e.g. 0·7 bu. per acre). Planting rows of trees at 330 to 660 ft. intervals was considered suitable for windbreaks. —J.F.C.

1355† STEUBING, L. Untersuchungen über die Konkurrenzwirkung von Gehölzwurzeln auf Ackerkulturen. Der Einfluss von Eichen als Standbäume in Hecken. [**Competition between tree roots and arable crops. The effect of the oak as a hedge tree.**] *Plant and Soil* 1955, **7,** No. 1, 1–25, bibl. 19, illus. [Bot. Inst., Potsdam-Sanssouci, E. Germany]

The cause of the reduced vitality of crops in the vicinity of hedge windbreaks has been investigated. Microclimatic investigations showed that air and soil temperatures were only slightly changed by the presence of the hedge. The moisture content of the soil, however, was reduced and this was caused not only by protection from the hedge, but by absorption of soil water by the roots of the hedge trees which, in this case, spread horizontally to a distance of 16 m. The strong competition for water by tree roots was shown by a reduction in the number and vitality of weed species and in the growth and yield of crops (maize, poppy, potato, oats and beet) with nearness to the hedge. It is recommended that trees planted for windbreaks should be those with vertical roots. In existing trees the drought effect caused by tree roots could be countered by cutting the tree roots along the edge of the field.—D.B.

1356† FOURNIER, F. Les formes et types d'érosion du sol par l'eau en Afrique Occidental Française. [**The forms and types of soil erosion by water in French West Africa.**] *C.R. Acad. Agric. Fr.* 1956, **62,** No. 4, 215–21, bibl. 1.

[See also *Fld Crop Abstr.* 9 : 587.]

1357 BLOODGOOD, D. W. and others. **Water evaporation studies in Texas.** *Bull. 787. Texas agric. Exp. Sta.* 1954, pp. 83, illus.

Data from water evaporation studies in Texas are presented, with details of the installation and operation of water–evaporation stations.—P.J.B.

WEEDS, WEED CONTROL AND WEEDKILLERS

1358 LINDSAY, D. R. **Taxonomic and genetic studies on wild oats (*Avena fatua* L.).** *Weeds* 1956, **4,** No. 1, 1–10, bibl. 11.

Studies were made on 3500 panicles of *A. fatua* in 7 localities of Western Canada, where the species is a serious arable weed. The main subspecies found was *A. fatua* ssp. *fatua* (L.) Thell, which had been classified into 4 varieties by Malzew. Each variety was found to consist of physiological races, differing in growth-habit and life-cycle. Population differences and varietal dominance in the localities were found not to be correlated with known ecological factors.—J.F.C.

1359 SHUMOVICH, W. and MONTGOMERY, F. H. **The perennial sowthistles in north-eastern North America.** *Canad. J. agric. Sci.* 1955, **35,** No. 6, 601–5, bibl. 15, illus. [Ontario Agric. Coll., Guelph]

Perennial sowthistles (*Sonchus* spp.) are common weeds in grain fields. From a study of plants in this region, 2 species (n = 9) were distinguished: *S. arvensis*, glandular pubescent and hexaploid, and *S. uliginosus*, glabrous and tetraploid.—J.F.C.

1360† BALLARD, L. A. T. **Flowering of skeleton weed.** *J. Aust. Inst. agric. Sci.* 1956, **22,** No. 1, 57–61, bibl. 3, illus. [Div. Pl. Industr., C.S.I.R.O., Canberra, A.C.T.]

Skeleton weed, *Chondrilla juncea*, has been shown to be an obligate long-day plant. It remains strictly vegetative when grown in an 8 hr. day and the critical photoperiod lies between 8 hr. and 14·5 hr. It may be induced to flower by 10 consecutive exposures to a long day of 20 hr. There is also some evidence of a cold requirement. These facts are discussed in relation to the distribution of the plants in Australia.—Author's summary.

1361 COUPLAND, R. T. and others. **The reproductive capacity of vegetative buds on the underground parts of leafy spurge (*Euphorbia esula* L.)** *Canad. J. agric. Sci.* 1955, **35,** No. 5, 477–84, bibl. 3, illus. [Dep. Pl. Ecol. Univ. Saskatchewan, Saskatoon]

1362 SCHRÖPPEL, H. Ein Beitrag zur Kenntnis des Ackerhohlzahnes mit Berücksichtigung seiner Bekämpfung. [**A contribution to knowledge of the hemp nettle, especially as regards its control.**] *Z. Acker- u. Pflbau* 1956, **100,** No. 3, 367–78, bibl. 26, illus. [Techn. Hochsch., München-Weihenstephan, Bavaria, W. Germany]

The hemp nettle is increasing in Germany, especially in S. Bavaria. A study has been made of the physiology of germination, influence of environment, and effect of herbicides on *Galeopsis tetrahit* and *G. pubescens*. It was found that the winter climate is an important factor in favouring seed germination, consequently, mechanical and chemical control are effective only in spring. Seed could germinate and emerge when at a depth not exceeding 5 cm., hence, control can be effected by deep harrowing in early spring. In experiments on chemical control, Raphatox (a DNC product) applied at the rate of 0·75% in 800 l. water/ha killed 65% of hemp nettle plants, and M52 (a MCPA product), applied at 6 l./ha. in 600 l. water killed 56%. These two herbicides were significantly superior to U46 and Hedronal, both of which are 2,4-D products. Seed cleaning by an ordinary electrically driven winnower removed 79% and 59% of *Galeopsis tetrahit* seed from grain of wheat and oats, respectively. Complete separation was attained by using the Röber "Petkus" machine which combines air flow, sieve and separator. The machine permits better control of the flow of air. The spread of *Galeopsis* seed could be prevented if seed cleaning with this machine became a common agricultural practice. The seeds lost the viability after 14 days' storage in stable manure; there is therefore little danger of spread of hemp nettle by this means.—D.B.

1363† BENITEZ B., A. Destrucción de la "*Salvinia*" en Ceilán. [**Control of *Salvinia auriculata* in Ceylon.**] *Agric. trop., Bogot* 1955, **11,** No. 10, 785–8, illus.

Salvinia auriculata is a noxious weed of water surfaces in Ceylon where it has invaded about 10,000 ha. It was probably introduced accidentally. Information is given on its control by treatment with the weedkiller Shell No. 30, applied at the rate of 20 gal. in 400–500 gal. of water per ha. A second treatment, given 3 weeks later, was recommended to obtain complete control. [See also *Fi Crop Abstr.* 6 : 1119.]—E.B.O.

1364† WILSON-JONES, K. **Weed control experiments in the Sudan.** *Pest. Abstr. New Summ., Lond. Sect. C.* 1956, **2,** No. 2, 36–5

Control of buda (*Striga hermonthica*) in dura [*Sorghum durra*], of water weeds in irrigation channels and of seid grass (*Cyperus rotundus*) discussed. Sodium 2,4-D at 0–2 lb. per fedda [1 feddan = 1·038 ac.] at various times after sowing has been applied to buda-infested dura. The dura variety Dwarf White Milo is very resistant to buda, but under treatment Wad Fahl gave much the highest yield. The best control was obtained by spraying at 1 lb./feddan, 14–21 days after sowing. The crop was somewhat damaged, but only in straw yield; spraying at 4 weeks old

later caused no damage symptoms. The less soluble Ca and Cu salts of 2,4-D, were applied to avoid leaching but did not differ in effect from the Na salt. Spraying treatment was similar to normal application of $(NH_4)_2SO_4$ in its effect on yield; together, their effects are additive and independent. The ethyl ester of 2,4-D had little effect because of its slow availability. MCPA is a convenient alternative. Application of salts of MCPA and 2,4-D to irrigation-canals to destroy *Potamogeton* spp. and *Naias* spp. were not successful as in small channels. 2,4-D mixed with lime or phenylacetic acid was effective in channels, but less so alone. As a combined snail- and weed-killer, $CuSO_4$ was useful and needs to be applied at about 0·5 ppm. at a time, as excess over this amount is precipitated by the alkaline canal-water. CMU at 15 rotls/feddan [1 rotl = 0·99 lb.] killed the top growth of seid grass : rosettes continued to appear but soon died off. Its tubers were 8·2% viable after treatment compared with 45% untreated.—J.F.C.

1365 ABEL, A. L. **Controlling perennial grasses by combined operations.** *Agric. Rev., Lond.* 1956, **2,** No. 1, 32–7, bibl. 7, illus.

Recommendations are made for the use of TCA in controlling couch grass (*Agropyron repens*) infesting arable land and crops, the herbicide being applied in autumn or spring as a pre-sowing or a post-emergent spray. High-volume (100 gal. of solution per ac.) applications containing half the dosage of herbicide applied twice, at 4–6 week intervals, were more effective than a single, full-rate application. Ploughing or cultivation should follow spraying, since the degree of control obtained is influenced by the extent to which the couch rhizomes are exposed to the chemical.—M.P.

1366† NAUDE, C. P. and SERFONTEIN, J. **Eradication of lantana and thorn trees.** *Fmg in S. Afr.* 1956, **31,** No. 360, 209–10, bibl. 4, illus.

Eradication of *Lantana camara* and thorn trees was obtained by spraying the basal 2 ft. of the stems with paraffin or diesoline solutions containing the amyl ester of 2,4,5-T at a concentration of 2.5 oz. a.e. per 2 gal. of solution. This quantity sufficed for 40 trees. The diesoline solution is recommended for general use as being the more economical.—M.P.

1367 IVENS, G. W. and COCHRANE, D. G. **Effects of 2,4,5-trichlorophenoxyacetic acid on evergreen thicket vegetation in Kenya.** *Trop. Agric., Trin.* 1956, **33,** No. 2, 136–44. [E. Afr. Tsetse and Trypanosomiasis Res. and Reclam. Organ., Nairobi, Kenya]

1368† SOUTHWICK, L. **New leads from recent field research with Dalapon.** *Down to Earth* 1955, **11,** No. 3, 6–7. [Dow Chem. Co.]

Dalapon is most active on hardy grasses when autumn-growth ceases ; the later the application, the longer the control period. Good control of quack [*Agropyron repens*] was obtained from 8–10 lb./ac. of 85% Na salt, which disappears from warm moist soil within 4 weeks. Split applications have been superior to single applications of a given weight. Dalapon can be mixed with 2,4-D etc., but its effect is reduced when mixed with highly active contact herbicides. Properly timed directed spraying is promising for control of grass in sensitive crops such as maize and cotton. Autumn applications to Ky bluegrass [*Poa pratensis*] at 5 lb./ac., caused some thinning and prevented shooting, but spring applications may cause severe injury. *Dactylis glomerata* is more tolerant. Aquatic grasses, sedges and cat-tails are controlled by 10–20 lb./ac. applied in a spray from an aeroplane.—J.F.C.

1369† JAWORSKI, E. G. **Biochemical action of CDAA, a new herbicide.** *Science* 1956, **123,** No. 3202, 847–8, bibl. 3. [Monsanto Chem. Co., Organ. Chem. Div., St. Louis, Missouri]

A brief report is given of the results of biochemical studies on the effect of α-chloro-*N*, *N*-diallyl-acetamide (CDAA) on the respiration, respiratory quotients and growth of germinating seeds of wheat (moderately susceptible) and ryegrass [*Lolium* spp.] (susceptible). From the results, it was concluded that the growth-inhibiting effect of CDAA on both species was due to the inhibition of certain sulphydryl enzymes which are involved in respiration in both species.—P.J.B.

1370† WANGERIN, R. R. **CDAA controls weed grasses in grass family crops.** *Fm Chem.* 1955, **118,** No. 12, 47–9, illus. [Monsanto Chem. Co.]

Rates of 3–4 lb./ac. of CDAA control foxtail [*Alopecurus* spp.], crab grass [*Digitaria* spp.], annual blue grass [*Poa annua*], cheatgrass [*Bromus secalinus*], wild oats [*Avena fatua*], and certain broad leaf weeds such as pigweed, carpet weed and purslane. CDDA, CDEA and CDEC caused no injury at normal rates when used as pre-emergence herbicides on field maize, soyabeans, flax, sugar-beet, cotton, groundnuts, seeded lucerne, red clover, Ladino white clover and birdsfoot trefoil [*Lotus* spp.]. Even at 12 lb./ac. there is no visible injury or reduction in the yield of major economic crops. CDDA is superior to the others because of its consistent effects. Most pre-emergence herbicides depend on suitable soil-moisture conditions for their maximum effect, but it is claimed that CDDA is highly effective for pre-emergence application on soils low in water. It is not readily leached on heavier soils. CDEC is the most suited to sandy areas. It has been shown that resistant plants

absorb CDAA, but metabolize it to glyoxylic and glycollic acids completely within 4–5 days. In Canada, a test of CDDA at 3 lb./ac. gave excellent control of wild oats in barley and flax, but the wheat yield was partly reduced at this rate. When the weeds are more than 1–2 in. high the substances do not show noticeable herbicidal activity.—J.F.C.

1371 HAMM, P. C. and SPEZIALE, A. J. **Herbicidal activity and structure. Relation of herbicidal activity to the amide moiety of *N*-substituted alpha chloroacetamides.** *J. agric. fd Chem.* 1956, **4,** No. 6, 518–22, bibl. 7. [Organ. Chem. Div., Monsanto Chem. Co., St. Louis, Missouri]

The herbicidal activity of a range of *N*-substituted α-chloroacetamides is reported. Depending on species, the germination of grass seeds was completely inhibited at different threshold concentrations of α-chloroacetamides. Many dicotyledonous species became increasingly susceptible to the α-chloroacetamides used at rates above the threshold-toxicity rates for grasses. Data are given of the tolerance of a wide range of weed- and crop-species to *N*, *N*-diallyl-α-chloroacetamide. Among resistant species were sorghum, maize, cotton, soyabeans, peas, potatoes, groundnuts and barley. Pre-emergence treatments resulted in good control of such broad-leaved species as *Amaranthus* spp., and *Euphorbia* spp. Excellent control of annual grasses in such crops as maize, cotton, groundnuts and linseed followed pre-emergence treatment with these compounds. Wild oats have proved very susceptible to such treatments.—P.J.B.

1372† STONE, J. D. and RAKE, D. W. **Effect of borate additives on herbicides.** *Agric. Chem.* 1955, **10,** No. 5, 36–8, 123–5, bibl. 5, illus. [Pacific Coast Borax Co., Los Angeles]

The disappearance of 2,4-D when applied to the soil has been shown to be due to micro-organic action and to adsorption on colloids. Experiments verified the stimulating action on soil-microbes and showed that concentrations, much higher than previously reported, were tolerated and metabolized. Sodium borates were chosen as microbe-inhibitors because of cheapness and their own herbicidal action. The most suitable mixture, DB granular, consists of 7·5% 2,4-D a.e. with 92·5% of a sodium borate. Mustard (*Brassica arvensis*) and oats, being respectively susceptible and resistant, were grown in pot experiments for 30 days, and then killed by drought ; 30 days' growth and killing were repeated several times in succession in the same pots to assess residual effects. The DB exceeded the combined herbicidal effect of 2,4-D and borate alone and this was ascribed to the action of borate on bacteria. After the third consecutive sowing, sufficient 2,4-D, initially applied alone (equivalent to 1 lb./100 sq. ft. of DB granular) remained to eliminate the mustard, while the oats survived well, even at the highest rate (66 lb./ac.), but the use of DB at 2 lb. per 100 sq. ft. killed oats completely. In field tests the mixture was very efficient in destroying *Convolvulus arvensis*, *Centaurea picris* and *Cirsium arvense*.—J.F.C.

1373 STRYCKERS, J. Is chemische onkruidbestrijding ook reeds mogelijk in hakvruchten ? [**Can chemical weedkillers be used with hoed crops?**] *Land. Tuinbouwjaarb.* 1955–6, 163–73, bibl. 10, illus. [State Agric. Coll., Ghent]

Information is given on selective herbicides which may safely be used to replace costly hoeing in the respective crops. Excellent results can be obtained in the case of maize. With beet and potatoes, it is mainly the early growth which can be protected against weed aggression. [See also *Fld Crop Abstr.* 8 : 276.]—G.M.R.

1374† BRITISH WEED CONTROL COUNCIL. **Weed control handbook 1956.** *Publ. Brit. Weed Contr. Coun.* 1956, pp. 130.

This publication, prepared by the Recommendations Committee of the British Weed Control Council, provides a concise and comprehensive guide to the properties and use of herbicides. It is intended primarily for the use of those concerned in advisory work, but will be of considerable value to all who are interested in agriculture, whether as farmers, research workers, or students. The subject matter is divided into two main sections. The first contains recommendations for the use of herbicides in agriculture and horticulture, on lawns and sports turf and on roadside verges. Information is also given on the response of different weed species to 2,4-D, MCPA, DNC, DNOSBP, selective mineral oils, H_2SO_4 and sodium nitrate, and there are recommendations for the non-selective use of herbicides for weed control, crop desiccation and the destruction of potato haulms. The second section deals with spraying techniques and procedures, aspects of the law in relation to herbicides and injurious weed seeds and weeds, the Crop Protection Products Approval Scheme of the Ministry of Agriculture, together with a list of approved herbicides for 1955/6, and an itemized list of new herbicides and their properties. There are several tables, including one summarizing the response of agricultural weed species to the substituted 4-(phenoxy) butyric acids. —P.J.B.

CROP BOTANY

1375† KOLLER, D. **The regulation of germination in seeds (review).** *Bull. Res. Coun. Israel* 1955, **5D,** No. 1, 85–108, bibl. 203. [Hebrew Univ., Jerusalem]

"This review is intended to summarize the recognized relationships between germination and the various factors which regulate it."

1376 LEIN, A. Triebkraft, ein fester Begriff der Praxis. [**Triebkraft, a well-established definition in practice.**] *Saatgutwirtschaft* 1956, **8,** No. 6, 178–80. [Saatzucht Ferdinand Heine, Schnega/Hann., W. Germany]

The retention of the word Triebkraft (seedling vigour) [see Abs. 456] rather than Ziegelgruswert is advocated and reasons are given. The following definitions are advanced. Keimfähigkeit (= germination capacity) : a seed is regarded as having germinated when, in an open seed-bed (sand or filter paper), the root and shoot have shown visible growth within 10 days. Triebkraft (=seedling vigour) : a seed has shown sufficient vigour when the seedling has penetrated a covering layer 3 cm. thick (brickdust by Hiltner's method) within 14 days. It is stated that the specialist group for seed examination of the Association of German Experiment- and Research-Stations decided that, for cereals and legumes, seedling vigour should be determined by Hiltner's brickdust method.—D.B.

1377 HEYDECKER, W. **Establishment of seedlings in the field. 1. Influence of sowing depth on seedling emergence.** *J. hort. Sci.* 1956, **31,** No. 2, 76–88, bibl. 16, illus.

1378 ROVIRA, A. D. **Plant root excretions in relation to the rhizosphere effect. 1. The nature of root exudate from oats and peas.** *Plant and Soil* 1956, **7,** No. 2, 178–94, bibl. 34. [Inst. Microbiol., Uppsala, Sweden]

1379 ROVIRA, A. D. **Plant root excretions in relation to the rhizosphere effect. 2. A study of the properties of root exudate and its effect on the growth of micro-organisms isolated from the rhizosphere and control soil.** *Plant and Soil* 1956, **7,** No. 2, 195–208, bibl. 12. [Inst. Microbiol., Uppsala, Sweden]

1380 KATZNELSON, H. and others. **The liberation of amino acids and reducing compounds by plant roots.** *Plant and Soil* 1955, **7,** No. 1, 35–48, bibl. 33, illus. [Bact. Div., Sci. Serv., Dep. Agric., Ottawa, Canada]

Root organic compounds freed by excretion or death stimulate various soil-organisms and may be important in influencing higher plants. Drying and remoistening, as occurs under field conditions, of various potted plants grown in sand, and in sand with soil, liberated appreciable amounts of amino acids and detectable amounts of reducing compounds. Small quantities of amino acids were produced even under normal conditions of growth. —J.F.C.

1381† LOCHHEAD, A. G. and ROUATT, J. W. **The "rhizosphere effect" on the nutritional groups of soil bacteria.** *Soil Sci.* 1955, **19,** No. 1, 48–9, bibl. 6. [Bact. Div., Sci. Serv., Canada Dep. Agric.]

The effect of various growing crops on the balance between certain nutritional groups of bacteria is discussed.—J.F.C.

1382 GILL, W. R. and MILLER, R. D. **A method of study of the influence of mechanical impedance and aeration on the growth of seedling roots.** *Soil Sci.* 1956, **20,** No. 2, 154–6.

An apparatus was developed to study simultaneously the effects of mechanical impedance and O_2 supply on root growth, other factors being purposely minimized. Using maize, the impedance effect could not be precisely stated, but the growth rate of unimpeded roots declined when the O_2 content fell below 10%, while the growth of even slightly impeded roots fell to zero. Distortion of normal shape, but no definite histological changes, were observed as a result of impedence.—J.F.C.

1383† SCHUURMAN, J. J. and GOEDEWAAGEN, M. A. J. **A new method for the simultaneous preservation of profiles and root systems.** *Plant and Soil* 1955, **6,** No. 4, 373–81, bibl. 7, illus. [Agric. Exp. Sta. and Inst. Soil Res., Groningen, Neth.]

Previous methods of soil preservation are discussed. A cellulose solution which penetrates the soil pores and dries to form a strip is preferred. Soil monoliths are obtained from the field using an iron frame and board. By using a pin-board, the roots are left in place after washing away the soil. From one monolith, several soil strips can be removed and the adjacent roots washed and kept. —J.F.C.

1384† NUTMAN, P. S. **The influence of the legume in root-nodule symbiosis. A comparative study of host determinants and functions.** *Biol. Rev.* 1956, **31,** No. 2, 109–51, bibl. 271. [Div. Pl. Industr., C.S.I.R.O., Canberra, A.C.T.]

This review brings together information on the

effect of host variation in legume symbiosis and discusses the theories which have been advanced to account for different aspects of the host's influence. In the context of the life-history of the nodule, the following aspects are considered : the physiology of infection ; cross-inoculation groups ; genetic resistance ; the determination of nodule sites ; the infected cell ; nodule form, growth, function and senescence ; genetic factors affecting host-bacterial compatibility ; the influence of host species on compatibility ; and the influence of the environment on the symbiosis. Lucerne, clover and peas are taken as the examples of leguminous hosts in the symbiosis. From the evidence available, the process of nodulation is summarized. The first stages in the formation of nodules on leguminous plants are non-specific and tentative in nature, requiring no direct contact between plants and bacteria. " The remainder involve an increasing degree of interaction between the symbionts, culminating in the intracellular phase . . . The importance of the plant meristem may be emphasized as the focus of infection (in its disomatic form), as the organ by which nodule growth is promoted and as a morphogenetic centre determining the general pattern of growth . . ."Little is known of the essential processes which lead to actual N fixation. A complex system of inherent factors is concerned in the inter-relationships within the infected cell, the elements of which are directly associated with specific factors in the bacteria, which factors are themselves inherently determined. None of these host- or bacterial-factors has any effect outside the symbiont, consequently nothing is known of their physiological or biochemical modes of action. The external environment appears to affect symbiosis largely through the host's physiology and metabolism.—M.P.

1385† MILTHORPE, F. L. **Plant growth and the weather.** *Inaugural Lecture. Univ. Nottingham* 1955, pp. 12.

The relationship between the crop plant and its climatic environment, and the use of growth responses to the weather for increasing productivity is discussed.—M.P.

1386† HALKIAS, N. A. and others. **Determining water needs for crops from climatic data.** *Hilgardia* 1955, **24,** No. 9, 207–33, bibl. 47, illus. [Univ. California, Davis]

The factors controlling plant transpiration and evaporation from the soil are described and a review of the literature is given. The best measure of water-use by crops is considered to be obtained by soil sampling. The change in weight per unit volume of dry soil can be converted to inches-use. For this conversion to be accurate, it is necessary for the soil to be fairly uniform, not too compact, and deep enough to accommodate the full spread of roots ; in particular, the root system should thoroughly permeate the soil. High correlation was found between evaporation from a white spherical Livingston atmometer and evaporation from a free-water surface, but the correlation between these and water-use by crops, was not high. However, the difference in evaporation between black and white Livingston atmometers was found to be closely correlated with the use of water by crops. This is expressed by the equation U = SD, where U is the monthly use by the crop in inches, S is a coefficient and D is the difference in monthly evaporation between the 2 atmometers in c.c. S is constant at all places for the same crop but only for the standard surfaces of the atmometers. It varies from 0·073 for artichokes to 0·1035 for lucerne. These values suggest that the latter completely covers the ground and that total leaf area is relatively unimportant. It was also found that plant height was not a determining factor in water-use. The rate of water-use by crops was found to vary much from year to year and among different plants, but it seems that if there is equal ground coverage, the use is the same in spite of variation in size. The coefficients given apply only to the usual spacing and spread of crops in California. In numerous localities it was shown that the correlation between atmometer difference and water-use held even down to the permanent wilting point, i.e. that transpiration did not decrease as soil moisture decreased. The correlation applied throughout the season after the crop had obtained its maximum spread. A high correlation was also found between the atmometer difference and solar radiation measured by the Eppley pyrheliometer. Thus where atmometer records are not available, the pyrheliometer may be used to measure water-use by crops.—J.F.C.

1387† ERKAMO, V. Untersuchungen über die pflanzenbiologischen und einige andere Folgeerscheinungen der neuzeitlichen Klimaschwankung in Finnland. **Investigations of plant-biological and some other consequences of recent climatic fluctuation in Finland.** *Ann. bot. Soc. zool.-bot. fenn., Vanamo* 1956, **28,** No. 3, 1–290, bibl. approx. 900, illus., English summary.

1388† TAMM, E. and others. Über die Ausbildung pflanzenklimatischer Temperaturen in Beständen landwirtschaftlicher Nutzpflanzen. [**The development of plant-climatic temperatures in stands of agricultural crops.**] *Z. Acker- u. Pflbau* 1956, **101,** No. 1/2, 193–232, illus. [Techn. Univ., Berlin-Charlottenburg]

The temperatures which develop within stands of winter rye, spring barley, oats, potatoes and sugar-beet at various stages of development have been measured and compared with temperatures

taken at a similar height over an area of bare ground in the vicinity of the crops.—D.B.

1389 Long, W. G. and others. **Loss of nutrients from plant foliage by leaching as indicated by radioisotopes.** *Science* 1956, **123,** No. 3206 1939–40, bibl. 10. [Hort. Dep., Michigan State Univ., East Lansing]

Young, rapidly growing bean, sweet-potato, poinsettia and rose plants were permitted to absorb P and K solutions containing P^{32} and K^{42} through the roots, or solutions containing P^{32} through the bases of cut stems. The plants were leached by a mist of distilled water for 4 to 48 hr. and the leachates collected. Beans and sweet-potato plants lost no significant amounts of P^{32} absorbed through the roots, but cuttings of bean plants lost 1·5% of the absorbed P^{32} by leaching. Ten-day old bean plants which had absorbed K^{42} through the roots for 12 hr. lost 2·2% of the absorbed K^{42} in the leachates. The results of further experiments with beans showed that the presence or absence of light during the time of nutrient absorption by roots and the concentration of the nutrient solutions both affected losses of nutrients by leaching. Chromatograms of leachates showed the presence of 4 or 5 amino acids and large amounts of galactan. The need for considering possible losses of nutrients from plants by leaching when making determinations of nutrient status, is stressed.—P.J.B.

1390 Arland, A. and Enzmann, J. Ein Beitrag zur Technik der "Anwelkmethode." (Über die Beziehungen zwischen Nährstoffversorgung und Transpirationsintensität bei Sommerraps). [**A contribution to the technique of the wilting method. On the relationship between nutrient supply and transpiration intensity of spring rape.**] *Z. Acker- u. Pflbau* 1956, **101,** No. 1/2, 5–21, bibl. 8, illus. [Karl-Marx-Univ., Leipzig, E. Germany]

The wilting method, referred to in *Fld Crop Abstr.* Vol. 7 : 59, 306, 330, and 694, has been applied to a study of the effect of nutrient supply on the transpiration intensity of spring rape. For determining the weight of water given off by a young plant, a new, rapid micro-balance has been designed which carries a special hanger containing 20 small dishes each capable of containing a young plant. The contribution made in these experiments is the relationship between protein content and resistance to wilting and yield. By increasing the protein content and hence, bound-water content, N fertilizers improve the water balance of crops.—D.B.

1391† Migahid, A. M. and El Shafei Ali, M. **Osmotic pressure of plant sap as related to salinity and water content of the soils.** *Bull. Inst. Desert Egypte* 1955, **5,** No. 1, 57–81, bibl. 23. [Bot. Dep., Cairo Univ.]

Field observations on plants in a variety of ecological habitats, on saline, desert and cultivated soils, are reported. The results of pot experiments to determine the separate influences of soil moisture and salinity on the osmotic pressure of *Vicia faba, Mesembryanthemum crystallinum* and *Citrullus colocynthis* are given. The osmotic pressure decreased with the increase of soil-water content and the decrease of salt content, irrespective of the nature of the ions present.—M.P.

1392† Beadle, N. C. W. and Tchan, Y. T. **Nitrogen economy in semi-arid plant communities. 1. The environment and general considerations.** *Proc. Linn. Soc. N.S.W.* 1955, **80,** Pt. 1, 62–70, bibl. 14.

An introduction to the N enconomy of semi-arid plant communities in western N.S.W. is presented. The significance of soil N and decline in fertility are discussed with regard to the pastoral erosion problem. Particular attention has been paid to the mulga (*Acacia aneura*) scrub in which premature death is rife.—From authors' summary.

1393 Stolwijk, J. A. J. **Wave length dependence of photomorphogenesis in plants.** *Meded. LandbHogesch., Wageningen* 1954, **54,** No. 5, 181–244, bibl. 85, illus.

The results are presented of detailed studies on the quantitative morphogenetic reactions of short-day and day-neutral plants to light of different, well-defined wave lengths, applied either as the sole source of light, or in addition to white light.—P.J.B.

1394 Allen, P. J. and Bacon, J. S. D. **Oligosaccharides formed from sucrose by fructose-transferring enzymes of higher plants.** *Biochem. J.* 1956, **63,** No. 2, 200–6, bibl. 30, illus. [Dep. Biochem., Univ. Sheffield]

The action of aqueous extracts of higher plants on sucrose, and on other di- and tri-saccharides, was studied by paper chromatography. In all cases, hydrolysis of sucrose was accompanied by the formation of trisaccharides. The significance of the results is discussed in relation to the hypothesis that leaf invertase participates in sucrose synthesis.—From authors' summary.

1395† Polster, H. and Fuchs, S. Verwendungsmöglichkeiten des Ultrarot-Absorptionsschreibers für Assimilations- und Atmungsmessungen im Freiland. [**The practicability of using the infra-red absorption recorder for the measurement of assimilation and respiration in the open.**] *Biol. Zbl.* 1956, **75,** No. 5/6, 373–6, bibl. 1, illus.

[Inst. Forstwissenschaften Tharandt, Dtsch. Akad Landwissenschaften, Berlin]

A modification of an instrument described by Egle and Ernst in *Zschr. Naturforsch.* 1949, is outlined. —M.P.

1396† HOFFPAUIR, C. L. **Report on starch in plants.** *J. Ass. off. agric. Chem., Wash.* 1956, **39,** No. 2, 423–6, bibl. 5. [South. Reg. Res. Lab., New Orleans, Louisiana]

Details are given of a procedure for determining the starch content of plant material. The results are given of determinations made on groundnut meal and lucerne.—P.J.B.

1397† HACKMAN, R. H. and LAZARUS, Marian. **Quantitative analysis of amino acids using paper chromatography.** *Aust. J. biol. Sci.* 1956, **9,** No. 2, 281–92, bibl. 22, illus. [Div. Ent., C.S.I.R.O., Canberra, A.C.T.]

1398† PIENAAR, W. J. **The quantitative spectrographic analysis of plant material with the aid of the direct current arc.** *Sci. Bull. 355. Dep. Agric. S. Afr.* 1955, pp. 16, bibl. 12, illus. [West. Prov. Fruit Res. Sta., Stellenbosch]

A spectrographic method for quantitative determination of K, Ca, Mg, Na, Mn, Fe and Cu in plant material without chemical preparation of the plant ash is described. Lithium carbonate is used as a spectrographic buffer. Small concentrations of Rb, Sn and Cr incorporated in a graphite dilutant, serve as internal standards. The reproducibility of the method is good, and the percentage standard deviation for all 7 elements is less than ± 6 per cent.—Author's summary.

1399† MATHIS, W. T. **Reports on the flame photometric determination of potassium and sodium in plant tissue.** *J. Ass. off. agric. Chem., Wash.* 1956, **39,** No. 2, 419–23. [Connecticut Agric. Exp. Sta., New Haven]

1400† LAWRENCE, W. J. C. **Techniques for experiments with pot plants.** *Plant and Soil* 1955, **6,** No. 4, 332–46, bibl. 10. [John Innes Hort. Inst.]

1401 BRADBURY, F. R. and WHITAKER, W. O. **The systemic action of benzene hexachloride in plants: quantitative measurements.** *J. Sci. Fd Agric.* 1956, **7,** No. 4, 248–53, bibl. 15. [I.C.I. Ltd., Res. Dep., Widnes, Lancs]

The absorption of α-benzene hexachloride (BHC) by a variety of seeds and by wheat seedlings has been measured. The amount of insecticide absorbed from the saturated vapour by seeds in 6 weeks varied from 31 μg./g. in wheat to 128μg./g. in linseed. The proceess has similarities to the absorption of α-BHC by insects. Wheat seedlings removed up to 100μg./g. (fresh weight) of α-BHC in 7 days from an aqueous solution bathing their roots, but increasing amounts of the insecticide were lost by the plant as the experiments proceeded.—Authors' summary.

1402 BALL, N. G. and DYKE, I. J. **The effects of indole-3-acetic acid and 2 : 4-dichlorophenoxyacetic acid on the growth rate and endogenous rhythm of intact *Avena* coleoptiles.** *J. exp. Bot.* 1956, **7,** No. 19, 25–41, bibl. 12, illus. [Bot. Dep., King's Coll., Lond.]

1403† DYER, R. A. **Poisonous plants.** *Fmg in S. Afr.* 1956, **32,** No. 1, 10–11, 38-9, coloured illus. by C. Letty in 2-page supplement.

Illustrated descriptions are given of 12 plants occurring in South Africa, which are poisonous to humans and livestock. These include *Adenia digitata, Ricinus communis, Datura stramonium, Cucusmi* spp., *Senecio* spp., and *Cannabis sativa*.—M.P.

MISCELLANEOUS

1404† GRASSLAND RESEARCH INSTITUTE. **Experiments in progress.** Hurley, 1956, No. 8, pp. 60, 5s.

1405† JEALOTT'S HILL RESEARCH STATION. **Guide to field experiments 1956.** Bracknell, 1956, pp. 52, illus.

1406† COLONIAL AGRICULTURAL, ANIMAL HEALTH AND FORESTRY RESEARCH COMMITTEE, GREAT BRITAIN. **Tenth Annual Report (1954-1955).** London, 1955, pp. 221.

A summary of the principal research developments during the year in the Colonial Empire is followed by condensed accounts of research in the different regions and countries.—C.L.S.

1407† COLONIAL PRODUCTS COUNCIL. GREAT BRITAIN. **Second Annual Report (1954-55).** London, 1955, pp. 49.

1408 MALAYA, FEDERATION OF, DEPARTMENT OF AGRICULTURE. **The Agricultural Bulletin of the Federated Malay States and the**

Malayan Agricultural Journal. Classified list of the principal original articles, 1912 to 1954 (Vols. 1-37). Kuala Lumpur, [n.d.] pp. 62. [Received May, 1956]

1409† MANNING, H. L. **Calculation of confidence limits of monthly rainfall.** *J. agric. Sci.* 1956, **47,** Pt. 2, 154–6, bibl. 3. [Cott. Res. Sta., Namulonge, Uganda]

Using rainfall data obtained over 12 years at Kibaya, Tanganyika, the author's use of transformation in calculating confidence limits of monthly rainfall [*J. agric. Sci.* 1950, 40, 169–76] is compared with the use of unadjusted monthly data as put forward by Glover and Robinson [see *Herb. Abstr.* 24 : 562]. The greater accuracy of the former method, for the precise analysis of climatological data, particularly where asymmetry in the data occurs, is stressed. The latter method is considered of use only where a simple and quick assessment of rainfall uncertainty is required.—M.P.

1410† MATEER, C. L. **A preliminary estimate of the average insolation in Canada.** *Canad. J. agric. Sci.* 1955, **35,** No. 6, 579–94, bibl. 9, maps. [Res. Sect. Met. Div., Dep. Transport, Toronto]

Charts of the estimated average insolation received over Canada during each month have been prepared. In making these charts, instrumental observations of insolation have been supplemented by estimates derived from empirical equations relating average insolation to average sunshine or cloudiness. In winter, the average insolation shows a distinct latitudinal gradient with values, in December, of about 100 langleys per day along the southern border decreasing to zero in the region of the polar night. In summer, the latitudinal gradient disappears completely with, in June, areas of maximum insolation ($\geqslant$ 600 l. per day) in regions of low cloudiness and areas of minimum insolation ($\leqslant$ 500 l. per day) in the cloudy regions bordering large bodies of water.—From author's abstract.

1411 MOORE, W. C. **Modern developments in crop protection.** *J. roy. agric. Soc.* 1955, **116,** 20–8. [Pl. Path. Lab., Harpenden, Herts]

The following subjects are reviewed : crop rotation, insecticides, fungicides, seed treatments, weedkillers, spray application, official approval of proprietary products for crop protection, health certification schemes, breeding for resistance, legislation, and co-operation.—J.F.C.

1412 LEBEN, C. and others. **On the nature of the mechanism of the water-soak method for controlling diseases incited by certain seed-borne pathogens.** *Phytopathology* 1956, **46,** No. 5, 273–7, bibl. 24. [Wisconsin Agric. Exp. Sta., Madison]

1413 RHOADS, W. A. and others. **A slowly soluble source of micronutrients for plants.** *Soil Sci.* 1956, **81,** No. 5, 359–69, bibl. 18. [Univ. California, Los Angeles]

The use of slowly soluble fertilizer compounds could be important for maintaining an available nutrient source over a long period and for preventing toxicity due to high concentrations. The effect of FTE (fritted trace elements) which consist of relatively insoluble silicates, with which micronutrients have been mixed, fused and then milled to a very small particle size, was studied in glasshouse experiments. Various crop plants, including beans, barley and soyabeans on various soils in clay pots were used. The materials did not prove to be a satisfactory source of Fe. With Mn, B and possibly Zn, there was a more effective uptake by plants ; the responses varied among soils and crops. At high application rates (1000 to 15,000 lb./ac.) there were toxic effects, barley being more tolerant than the other species.—J.F.C.

1414 OLIVEIRA, A. J. de. Estudos de estatística agronómica. 5. Os modernos inquéritos estatísticos por amostragem no estudo dos problemas agrários nacionais. [**Studies on agronomic statistics. 5. The modern statistical sampling surveys for studying Portuguese agricultural problems.**] *Agron. lusit.* 1954, **16,** No. 4, 283–346, bibl. 29, English summary. [Esta. Agron. Nac., Sacavém, Portugal] [Received Dec., 1955]

1415† DI PRIMA, S. Aspetti particolari di problemi di ecologia agraria e di bio-statistica. Nota 2. [**Particular aspects of problems of agricultural ecology and of biostatistics. Note 2.**] *Suppl. Ann. Sper. agr.* 1956, **10,** No. 1, 75–84, English summary. [Sta. Agr. Sper., Bari, Italy]

It is shown how ecological investigations are reduced to mathematical procedures and biostatistical analyses. The concordance between the differential analysis of yield and the statistical analysis of variance is also shown. Various aspects of the meteorological equivalents, and the problem of continuity and discontinuity, are discussed. [See also *Fld Crop Abstr.* 8 : 1081.]—From author's summary.

1416 STEVENS, W. L. **Rotation experiment in Brazil.** *J. agric. Sci.* 1956, **47,** Pt. 3, 257–61, bibl. 4. [Univ. Sao Paulo]

This paper is concerned with problems of statistical analysis of rotation experiments. The experiment described is sufficiently general in its design for it to serve usefully as a basis for discussion of methods of analysis, both of the mean yields and of the measure of secular trend. It is shown that rotation experiments, without replicates within series, can be adequately analysed.—From author's summary.

REPORTS

The notes below indicate the main investigations in the reports covered, in so far as they concern this journal. Where a separate abstract has been made from a particularly interesting section of a report, this is indicated.

1417 **Great Britain.** Rothamsted Experimental Station. Report for 1955. Harpenden, 1956, pp. 256, 8s. 6d.

INVESTIGATIONS REPORTED :

1. Irrigation experiments on grass, sugar-beet, barley and potatoes, Woburn. By H. L. Penman, pp. 41 and 176. Extra N was again more important for barley than extra water. Yields of Majestic (maincrop) potatoes were high in 1955, those of irrigated plots receiving N, being double those of the unwatered plots and being 19–22 tons per ac. The watered plants were a much lighter green in mid-July and flowering was delayed 10–15 days.

2. Fertilizer placement. By G. W. Cooke and F. V. Widdowson, p. 43. Muriate of potash placed beside the seed gave consistently higher yields of potatoes than broadcasting. Placing and broadcasting of ammonium sulphate gave similar yield increases. A single dose of K, combine-drilled, gave higher yields of barley than twice as much K broadcast and harrowed into the seed-bed.

3. Comparison of methods of application and forms of nitrogen fertilizers. By G. W. Cooke and F. V. Widdowson, pp. 43–5. At one centre, 3 cwt. nitro-chalk sufficed for maximum yields of 3 varieties of stiff-strawed winter wheat. At the other 2 centres, yields rose as N dressings increased to 9 cwt. per ac. Splitting the N dressing did not give consistent gains. With an additional top-dressing of nitro-chalk in May, broadcasting of ammonium sulphate on the seed-bed was consistently better that drilling, for spring cereals, and straw-yield increases corresponded to grain yields. Drilling calcium nitrate was superior to broadcasting for barley ; the reverse held for wheat. Both calcium nitrate and ammonium sulphate raised the yields of potatoes more when applied before sowing than as a split dressing, but the calcium nitrate was inferior to an equivalent amount of ammonium sulphate. Kale yields responded slightly better to split applications of N than to dressings applied wholly at sowing.

4. Interaction between iron and micronutrient elements in flax, soyabeans and peas. By K. Warington, pp. 70–1. [See Abs. 624.]

5. Nutrient uptake from leaf sprays. By G. N. Thorne, pp. 71–2. The trials with small swede plants were continued. More P^{32} was absorbed in 3 days by plants under transparent or opaque covers than by uncovered plants. Results with illuminated and darkened plants suggest that translocation of P from sprayed leaves is dependent on simultaneous movement of carbohydrates. Combining an N spring top-dressing with 2,4-D as a weedkiller for winter wheat, as a spray, is considered undesirable because of the lower recovery (about half) of N in the crop from the spray than from fertilizer applied to the soil.

6. Wild oat studies. By J. M. Thurston, pp.73–5. [See also Abs. 235.] Prolonged undisturbed burial induced dormancy in some seeds of wild oats. At Hoosfield the mean numbers of viable wild oat seeds per sq. yd. were : 4·9 after winter rye ; 2·9 after winter wheat ; 2·2 after winter barley ; 1·5 after spring barley ; 0·6 after fallow. In an experiment in Northamptonshire, the number of potentially viable seeds after a 1-year ley was nearly halved, but was around 6 million per ac. At Boxworth, plots ploughed in the autumn of 1954 after 4 years under ley contained 2 plants per sq. yd. in May, 1955. In pot trials, barley was a more effective competitor than rye or wheat, with *Avena ludoviciana*. Spraying wild oats at panicle emergence with 1·5 lb. maleic hydrazide per ac. decreased the viable seeds by 45% but the germination of barley grain from the crop in which the wild oats grew was decreased by 28% and many seedlings were deformed. Maleic hydrazide applied at 0·75 lb. per ac. had no effect on the barley but reduced the number of viable oat seeds by only 17%. Late spraying of the wild oat plants decreased the number of viable seeds and reduced dormancy.

7. *Polygonum persicaria* studies. By J. M. Thurston, p. 74. Higher temperatures favoured the germination of this weed. Germination percentage and rate of germination were increased by chipping or removing seed coats, or soaking in tap water or 2% KNO_3 solution before sowing. Dormancy decreased after 3–4 months' storage in the laboratory.

8. Varietal differences in yield of barley. By G. N. Thorne and others, pp. 76–7. The experiment has been started to determine whether varieties differed in respect of the contribution made by photosynthesis in different parts of the plant to the total dry matter entering the grain.

9. Effect of varying soil-moisture deficit on plant growth. By P. C. Owen, pp. 77–8. In glasshouse experiments variations in the soil-moisture content from field capacity to near wilting point had no effect on the dry-weight, net assimilation rate or leaf area of sugar-beet. Results of field trials with, and without, irrigation during 1955, suggest that rainfall after prolonged drought in amounts small in comparison with the soil-moisture deficit may

temporarily at least, have very large effects on leaf growth and photosynthetic efficiency.

10. An attempt to increase yield by controlling leaf area index. By D. J. Watson and others, pp. 78–9. The net assimilation rate of a thinned kale crop, where the leaf area index was 3–4, was higher than that of an unthinned crop, where the leaf area index was 5–6 in August and September, but the yield was only slightly higher. [Leaf area index = leaf area per unit area of land.]

11. Manganese oxidation in the pea plant (*Pisum sativum*). By R. H. Kenten and P. J. G. Mann, pp. 82–3. [See Abs. 259.]

12. Enzymes of bracken. By R. H. Kenten, p. 83. Attention has been largely confined to the enzyme thiaminase. Estimation of crude thiaminase preparations from young bracken fronds by a modified method was satisfactory, but failed with similar preparations from older fronds.

13. Barley yellow dwarf. By M. A. Watson and T. Mulligan, p. 92. Plumage Archer barley infected with barley yellow dwarf on 25 April and 3 May yielded 66% and 84% grain, respectively, compared with uninfected controls. Straw weights were not affected.

14. Control of potato virus diseases. By L. Broadbent and G. D. Heathcote, pp. 94–5. Systox, Parathion, Endrin and DDT emulsion prevented the spread of leaf roll, but decreased the infection with rugose mosaic by only 25%. Planting very early or late and lifting seed tubers 12 weeks later resulted in low virus disease incidence. Seed tubers harvested after the haulm had dried gave plants that yielded 10% more tubers than did seed harvested after 12 weeks' growth.

15. Sugar-beet virus diseases, pp. 96–100. The yield of roots in the field was again correlated with severity of leaf symptoms (as shown under glass). Plots sprayed 3 times with Systox [no rate given], receiving full fertilizer, and with a high plant population gave the largest response, 1 ton of beet per ac. Soaking sugar-beet seeds in Hanane or N.C.7. resulted in the seedlings being aphicidal, but germination was reduced. Watering the rows at time of drilling affected germination less and made seedlings aphicidal for 3 weeks.

16. The value of "Conserbeta" as a shoot depressant for clamped mangels and fodder beet. By C. E. Cornford, p. 99. [See Abs. 144.]

17. Fungal diseases of cereals. By M. D. Glynne and others, pp. 103–5. [See Abs. 1073.]

18. Fungal diseases of sugar-beet. By L. F. Gates, p. 106. Seed soaked in ethyl mercury phosphate or Captan and dusted with BHC gave 10% more seedlings than those dusted with Mergamma. Pouring a solution or suspension of the fungicides along rows drilled with seed dressed with ethyl mercury phosphate gave 6% more seedlings.

19. Eelworm population studies. By D. W. Fenwick, p. 111. The greatest build up of *Heterodera major* occurred in oat plots, the population remained constant under barley and decreased under rye. On commercial fields in Shropshire, the eelworm population fell during 3 years without host crops, doubled under barley and was halved under rape and black mustard.

20. Control of bean aphid (*Aphis fabae* Scop.) on field beans. By M. J. Way and R. van Baer, pp. 125–6. [See also Abs. 840.] In 1955, Metasystox, 0·05% active ingredient in 100 gal. water per ac., sprayed once on 23 June did not give perfect control of the aphid, especially with late-sown beans.

21. Control of wheat bulb fly (*Leptohylemia coarctata* Fall.). By R. Barden and M. J. Way, pp. 126–8. Wheat yields were higher where seed had been dressed with Dieldrin at 2·25% w/w of seed; where a 4% Dieldrin dust had been drilled with the seed at 120 lb. per ac.; or sprayed with Parathion at 0·05% v/v active ingredient in 100 gal. per ac. early in February; but plots sprayed with Parathion in April yielded less than the untreated controls.

22. Powdery mildew of barley, p. 130. The reduction of barley yields by powdery mildew was confirmed. Plots sprayed four times with 1 in 80 lime sulphur yielded significantly more than unsprayed plots.

23. Ley/arable rotation, pp. 157–9. A slightly altered cropping sequence was introduced. On Highfield the benefit of the old turf was noticeable, all crops were more productive than on Fosters. At this stage of the trials, rotations based on leys had no particular advantage over purely arable cropping.

24. Nitrogen fertilizers on spring wheat and barley, Woburn. By H. H. Mann, p. 177. N applications above a very small dose increased grain and straw yields of Koga II wheat and Herta barley. With Herta, nitrochalk at 6 cwt. per ac. increased grain yields by 119% and straw yields by 247%. The number of ears per unit length of row increased by 26% with the first 2 cwt. of N, 12% with the next 2 cwt. and 2% with the third 2 cwt. The length of ears increased almost in proportion to the amount of N applied.

25. Maize. By H. H. Mann, p. 178. The Dutch varieties C.I.V. 2. and C.B. 30 yielded 25–30 cwt. dry grain per ac. Yields were low owing to the prolonged drought in the summer of 1955.

26. Fodder crops for semi-acid soils. Jerusalem artichoke, "topine" strain. By H. H. Mann, p. 180. The 1954 crop of tubers, harvested in February, 1955, yielded 8 tons per ac. [as estimated]. The 1955 crop planted 26 April and cut 31 October yielded 9·4 tons of green tops per ac. containing 30% dry matter.—M.P.

1418 **Basutoland** Department of Agriculture.

Annual Report for 1955. Maseru, [n.d.] pp. 67, illus. [Received May, 1956]

INVESTIGATIONS REPORTED :

1. NPK exploratory trials, pp. 36–52. These were continued on several different soils in a number of localities, with maize, wheat and sorghum as the test crops. Responses to P, applied as a 50 : 50 mixture of raw rock phosphate and superphosphate on acid soils, and as superphosphate on soils of pH above 6, were noticeable in the grain yields of all 3 crops. P also increased the yield of wheat straw at all centres. In maize trials at Leribe and Maseru, applications of 20–60 lb. N per ac., as ammonium sulphate, raised grain yields.

2. Weed control in maize, Maseru, pp. 52–3. Hand-cultivation with, or without, one implement-cultivation, was markedly superior to either pre- or post-emergence spraying with 2,4-D and better than implement-cultivation, as reflected by grain yields.

3. Crop studies, Maseru, pp. 53–6. Top-yielding maize varieties were : K.64 × P.P. topcross, S.A. 200 double hybrid, Potchefstroom Pearl, and Topbrid, with 8·9, 8·0, 7·8 and 7·7 bags per ac., respectively [1 bag = 200 lb.]. In winter-wheat trials, White Spitzkop, Punjab and Red Spitzkop were top-yielders, with 3·8, 3·8 and 3·7 bags per ac., respectively, when sown in mid-April, and yielded 2·5 (top-yielder), 2·1 and 2·3 bags per ac., respectively, when sown early in June.—M.P.

1419 **Gold Coast** Department of Agriculture. Annual Report for 1953–4. Accra, 1956, pp. 30, 3s. 6d.

Cassava, p. 10. At Kwadaso, Ashanti, first-season planting was better than second-season planting. Yields increased up to the 15th month. Garri was the highest yielder followed by Ankra, Calabar, Queen and Williams.

Maize, p. 10. The introduced variety Tsolo has the disadvantage that, in the Northern Territories, it suppresses the interplanted guinea corn.

Rice, p. 11. Harvesting some 5 days before the crop was fully ripe appeared to reduce sun-cracking. Yields from rice grown for the 8th consecutive year on the same swamp land at Esiama have declined over the last 3 years.—C.L.S.

1420 **British Guiana** Department of Agriculture. Annual Report of the Director of Agriculture for 1953. Georgetown, 1956, pp. 45.

INVESTIGATIONS REPORTED :

1. Spacing trials with soyabean, p. 16. The variety Ringgit gave higher yields and better ground cover at a spacing of 9 in. × 9 in., than at 24 in. × 9 in.

2. Manurial experiments with rice, Georgetown, pp. 22–3. A split application of 2 cwt. per ac. sulphate of ammonia, half applied 3 days after sowing and half almost 4 weeks before flowering, again increased rice yields. NH_3 was again shown to be the main fraction of soil N utilized by the rice plant. In pot experiments, rice seedlings receiving NH_3, only, and NH_3 + NO_3 were similar and normal in growth ; seedlings receiving NO_3 only, were severely chlorotic.

3. Insect pests of rice, pp. 23–4. Less than 45 lb. per ac. of 20% BHC appeared to suffice for the control of adult *Mormidea poecila* (padi bug) in rice. The grass *Hymenachne amplexicaulis* was found to be the alternative host for adults and larvae of this bug when the padi crop reached the ' hard-ripe' stage. Dusts containing 0·65% BHC, 0·5% BHC and a 1% Chlordane spray [rates unspecified] gave good control of rice caterpillar.

4. Cotton varietal trials, p. 24. The Sakel varieties appeared most promising, followed by African Uplands and 2 American Upland varieties, as an autumn crop. The variety BLR 14/25 yielded 956 lb. seed cotton per ac.—M.P.

1421 **Malaya, Federation of,** Department of Agriculture. Annual Report for the year 1954. By R. G. Heath. 1955, pp. 78, illus.

INVESTIGATIONS REPORTED :

1. Rice, photoperiodism in, p. 25. The object of research with rice is : to obtain information as a basis for selecting non-photoperiod-sensitive varieties for out-of-season planting ; to determine the optimum planting time for photoperiod-sensitive varieties ; and to furnish fundamental data for the improvement of agronomic practice in regard to varietal sensitivity. The first of the experiments completed in 1954 suggests that maximum yield is obtained at a maturation period 20–25% longer than the minimum.

2. Rice nutrient requirements, pp. 26–7. Reduced supplies of P and K delayed flowering by 5–10 days, whereas reduced N supply accelerated it by 7 days. From field and laboratory studies, red sickness appears to be a complex of acute nutritional deficiency symptoms.

3. Rice, mechanization, pp. 45–6. A large number of trials of various mechanical equipment is reported. The trials include experiments with selective herbicides.

4. Rice, fertilizers for, pp. 46–7. Some conclusions from a large number of trials reported are as follows : of nitrogenous fertilizers, sulphate of ammonia is nearly always superior to nitrate of soda. Placement of N 4 in. below the surface has no advantage over broadcasting on the mud surface. Small doses of calcium salts have given beneficial effects in the absence, but not in the presence of, NPK. Similarly, Mg showed no regular response in the presence of NPK. It was found more economic to use cheaper, double dressings of insoluble forms of P_2O_5 than single dressings of the costly water-soluble forms. Nursery manurial trials using mono-ammonium phosphate gave encouraging results.

A spacing trial incorporated in a manurial trial showed the optimum spacing for north Kedah to be about 9 × 9 in.

5. Rice, dry land, pp. 47–8. Limited experiments in two localities indicated that, given a good N.E. monsoon, dryland rice may be expected to show spectacular responses to N, P and K.

6. Fibre crops, jute, pp. 36 and 55. In a field trial, a yield of 1799 lb. per acre was obtained. Stem canker, serious on the Segama variety, was controlled at Kuala Lumpur by spraying with a copper fungicide.

7. Cover- and green-manure crops, pp. 57–8. *Desmodium scorpiurus*, imported from New Guinea, is under trial as a ground cover. Study is being made of the effect on the growth and yield of rice of growing *Sesbania aculeata* during the off-season. This green-manure crop can be established by broadcasting soaked seed into the ripe rice crop one week before harvest.—G.M.R.

1422 **Tasmania** Department of Agriculture. Annual Report for 1954–55. Hobart, 1955, pp. 50. [Received April, 1956]

INVESTIGATIONS REPORTED :

1. Potato variety trials, p. 24. At Leith, the early variety Bismark was superior to Pink Eye and Duke of York, when harvested early and when mature. Of the mid-season and late varieties at Elliott Research Farm, Sequoia was top-yielder with 14·8 tons per ac. Two Brownell hybrids yielded over 12 tons while Medium Brownell, the control variety, yielded 7·5 tons per ac.

2. Spray irrigation of potatoes, Elliott Research Farm, p. 25. Yields of Medium and Late Brownells were raised to 20 tons per ac. by irrigation ; cracking was negligible on irrigated plots, but severe on non-irrigated plots. Complete fertilizer at 20 cwt. per ac. was better than at 15 cwt. per ac. and only slightly poorer than at 25 cwt. per ac. Late Brownells were superior to Medium Brownells.

3. Weed control, pp. 25–6. The control of most weeds in crops was successful with 0.5 lb. a.e. 2,4-D per ac., with the exception of cape weed, charlock, wild radish and wild turnip which required 1 lb. a.e. per ac. Grass and weed growth on roadside verges and ditches was controlled for 6–12 months by applications of TCA + 2,4-D or TCA + NaOCl, [rates not given]. TCA at 100 lb. per ac. controlled couch grass and onion twitch, if applied to bare ground or broken sods. 2,4-D and 2,4,5-T at 20 lb. per ac. gave good control of triangular stalked onion weed ; CMU at 50 lb. per ac. also gave excellent control, the plots remaining bare of all vegetation for several months after harvest.—M.P.

BOOKS

1423 SØMME, A. **Geography of Norwegian agriculture. A. Text-volume.** 1954, pp. 414, bibl. 125, illus., Bergen ; Norwegian Univ. School of Business, 27 × 20 cm.

1424 SØMME, A. **Geography of Norwegian agriculture. B. Atlas.** 1949, pp. 112, Bergen ; Norwegian Univ. School of Business, 27 × 20 cm.

1425 AZZI, G. **Agricultural ecology.** English edn 1956, pp. xv + 424, bibl. 221, illus., London ; Constable and Co., Ltd., 22 × 14 cm., 45s.

[For abstracts of the Italian and Spanish versions see *Fld Crop Abstr.* 3 : 663 and 664; 4 : 261.]

1426 CURTIS, J. T. **Plant ecology workbook. A laboratory, field and reference manual.** Revised edn 1956, pp. 86, bibl. 218, illus., 3 charts ; Minneapolis, Minn., Burgess Publ. Co. ; 28·5 × 23 cm., $3·25.

This is a loose-leaf notebook for practical work in elementary plant ecology and is designed for use with the forest and prairie vegetation of the North Central states of the USA. The book is weighted on the side of forestry rather than grassland. Section 1 consists of instructions, with field-data sheets, for carrying out laboratory and field exercises on such aspects, amongst others, as plant competition, plant communities, measurement of environmental factors, the effect of fire and of grazing. Section 2 contains keys for the identification of grasses and of trees and shrubs in summer and winter, vegetation and soil maps, and physical conversion tables including those for the conversion of diameter and circumference to basal area. Section 3 consists of a classified bibliography of 218 books and papers on ecology.—D.B.

1427† WILD, H. **Common Rhodesian weeds.** [1955] pp. 220, illus., Salisbury ; Govt Printer. [Received May, 1956]

This booklet contains information on 100 common Rhodesian weeds, mostly of arable land. The scientific, English and native names, and brief botanical descriptions are given, together with notes on the distribution and role of each species as a weed in Rhodesia. The control measure recommended for all weeds is clean cultivation, but mention is also made, where possible, of the suitable rate of application of chemical weedkillers and the

reaction of the plant to the herbicides. Each species is illustrated by a simple line drawing, and the early seedling stage is also shown.—M.P.

1428† WILD, H. **A Southern Rhodesian botanical dictionary of native and English plant names.** 1953, pp. viii + 139, bibl. 5, Salisbury; Govt Printer, 22 × 12 cm., 10s. 6d. [Received July, 1956]

1429 KORSMO, E. Ugras inåtidens jordbruk. [**Weeds in present-day agriculture.**] 1954, pp. xii + 635, bibl. in text, illus., Oslo A-S Norsk Landbruks Forlag, 25 × 17 cm 27s. 6d.

1430 KORSMO, E. **Anatomy of weeds.** 1954 pp. 413, illus., Oslo; Grøndahl and Son 35 × 26 cm., 98s. [Received July, 1955]

1431 FINNEY, D. J. **Experimental design and i statistical basis.** 1955, pp. xi + 169, bib 74, 22 × 14 cm., London; Cambridg Univ. Press, 30s.

NEWS ITEM

Western Australia

1432 PAN-INDIAN OCEAN SCIENCE CONGRESS, 1954. The Proceedings of this Congress have now been published. Copies of the complete volume are obtainable from the Hon. Secretary (Professor A. D. Ross), Balnagown, Golf Links Road, Albany, W. Australia, price 37s. 6d post free. Booklets of the individual sections are available only to those who ordered them in advance. Sections B and D (Biological and Agricultural Sciences) include the following papers, among others: Regions of genetical interest; External relationships of the Indian flora; Biologica reconnaissance of the territories around the Indian Ocean Plant introduction and exploration in Australia and th Indian Ocean region; Phyto-chemical aspects of th Australian flora; Cotton-growing in Mozambique; O rice production (Asia and America); Wheat-growing i Southern Mozambique; Farming patterns and soil fer tility; Crop establishment in a lateritic red earth a Katherine in the Northern Territory [Australia].—M.H.

ANNUAL SUBJECT INDEX, VOL. 9, 1956

References are to abstract numbers. R.A. = Review article. * = Title only.

Acacia aneura, 1392
A. hypophylla, 850, 1035
Acanthoscelides obtectus — see Bean beetle
Acanthospermum hispidum, 894
Acha (*Digitaria exilis*), 1005, 1162
Aconitic acid, 561
Aden, cotton, 543
Adenanthera pavonina, seed storage, 257
Adenia digitata, 1403
Aegopodium podagraria, 602
Aelia germari, 350
Aerial photography, 221*
Aerial spraying, 580, 581, 675, 960,* 1075
Aerial surveys, Colonial territories, 217
Africa — see also individual territories
botanists and zoologists, 637*
Digitaria spp., 1162
East
East Afr. Agric. and For. Res. Org. Rep. 1954–5, 1027
East Afr. Roy. Comm. Rep.1953-5, 1026
land use, 1026
maps, 1026
soil and water conservation, 1353
Equatorial (French)
agriculture in Niari Valley, 571*
Inter-African Conf. Agric. Mech., 577*
land use, 925
maize, origin of, 63
rice, 1176*
soil surveys, 925
South of Sahara
Inter-Afr. Conf. Co-operation Socs., 640*
maps, 568, 569
scientific institutes, organizations and services, 638,* 639*
West Afr. Maize Rust Res. Unit Rep. 1953, 401
West (British), rice, 1168
West (French)
C.G.O.T. Groundnut Scheme, 1217
rice, 423, 773
soil erosion, 587, 1356*
African locust bean (*Parkia filicoidea*), 1005
African star grass (*Cynodon plectostachyus*) for soil conservation, 1035
Agricide 25 — see Insecticides
Agricultural advisory services, Bavaria, 567
Agricultural Census, Nigeria, 218
Agricultural development, Nigeria, 658
Agricultural ecology, 1425*
Agricultural economics, 313, 566*
Agricultural land development, S. Australia, 583
Agricultural mechanization
Africa, 577*
Bavaria, 567
Agricultural production, 920, 1043
Agricultural research, 633, 1406
Agricultural surveys, 1339
Borneo (North), 216
Portugal, 1414*
Queensland, 219, 573
Sudan, 570*
USSR (Altaï), 214
Wales, 566*
Agriculture, 629*, 920
Africa (Niari Valley), 571*
Bavaria, 567
Haiti, 1036*
Korea (South), 662*
Morocco, 209*
Nigeria, 1037*
Norway, 1423,* 1424*
Queensland, 1337
Romania, 1113
South Africa, 572
Turkey (Anatolia), 220
USSR, perpetual frost zone, 222
water in, 1044
Agrilus acutus, 907
Agrimycin 100 — see Fungicides
Agriotes spp.— see Wireworms
Agropyron repens — see Couch grass
Agrosan G.N.— see Fungicides
Agrostis spp.— see Twitch
Agrotis orthogonia — see Pale western cutworm
Agrox — see Fungicides
Agroxone — see Herbicides
Air pollution, 274, 998
Akand (*Calotropis procera*), 1083
Albrecht soil borer, 961
Aldrin — see Insecticides
Algeria,
barley,722
soyabeans 463, 464,
Alhagi camelorum–see Camel-thornbush
Alisma plantago, 80
Alopecurus spp.— see Foxtail
Alpha-chloroacetamides — see Herbicides
Alpha-naphthalene acetic acid — see Growth substances
Alpha (2,4,5-trichlorophenoxy) propionic acid — see Growth substances
Alpha-3-indolyl-butyric acid — see Growth substances
Alternaria solani, 1034
Aluminium pentasilicate — see Insecticides
Amaranthus spp., 1371
American bollworm (*Heliothis armigera*) — see Bollworm
Annual blue grass (*Poa annua*), 1370
Anthriscus silvestris, 602
Antibiotics
streptomycin, 871, 908, 1132
terramycin, 966, 1132
Anticarie — see Fungicides
Aphanomyces cochlioides — see Black root
Aphanus sordidus, 825
Aphids, 1023
Aphis fabae, 840, 1417
A. gossypii, 896
Myzus persicae, 1247
Arachis hypogaea — see Groundnuts
Aramite — see Insecticides
Arasan — see Fungicides
Arbitex — see Insecticides
Argentina, cereal storage in underground silos, 104
Armyworm
Laphygma exempta, 649
L. frugiperda, 762*
Aromatic solvents — see Herbicides
Arsenic pentoxide — see Herbicides
Artemisia absinthium, 694
Ascochyta pisi, 123, 478
Asphodelus istulosus—see Onion weed
Astragalus sinicus, nodulation, 485
Australia
CSIRO, 655, 674
flora, phyto-chemical aspects, 1432
New South Wales
barley, 714
Dep. Agric. Rep. 1954, 656
land reclamation, 950
maize, 64
oats, 714
soil and water conservation, 230, 231, 590, 591, 592, 939,* 941
wheat, 687
North, crop establishment, 1432
plant exploration, 1432
plant introduction, 1432
Queensland
agricultural survey, 219, 573
agriculture, 1337
Dep. Agric. Stock. Rep. 1954–5, 1035
land reclamation, 950
maize, 736, 737
South
barley, wind damage, 1055
land development, 583
soyabeans, introduced and tested, 466
Tasmania Dep. Agric. Rep. 1954–5, 1422
Victoria
soil and water conservation, 574
wheat, 4, 710
weeds, 675
West
Pan-Indian Ocean Science Congress 1954, 1432
salt-land survey, 1336
wheat acreage changes, 677
Avena spp.— see Oats
Azetidine in plants, 261
Azolla sp., 240
A. filiculoides, 239
Bacterial leaf spot (*Pseudomonas sesami*) — see Leaf spot
Bacterium stewartii — see Wilt
Bajri (*Pennisetum typhoideum*) — see Millet
Bambarra groundnut (*Voandzeia subterranea*), 1005
Banded cucumber beetle (*Diabrotica balteata*), 819
Barley (*Hordeum* spp.), 303 — see also Cereals
amino acid in seed, 376
awns, 728
before sugar-beet, 856
brewing, protein content, 1107
carbon-dioxide fixation, 378,* 380*
climate, 94, 1107

combine-harvesting and germination, 1109
diseases
barley yellow dwarf, 1417
blight (*Helminthosporium* spp.)
H. gramineum, 726, 727
H. sativum, 458, 726
H. teres, 458
powdery mildew, 1417
rust (*Puccinia graminis tritici*), 98
smut (*Ustilago* spp.)
U. hordei, 726, 727
U. nuda, 54, 375, 725, 726
drought resistance, 381
fertilizers, 295, 384, 583, 645, 646, 649, 857, 1073, 1111, 1417, 1349 — see also nutrients below
fertilizer placement, 857
flooding, response to, 732
germination, 54, 376, 456, 458, 723, 797, 1109
grain-test number, 1108
growth and water, 731, 1078
growth substances, maleic hydrazide, 730, 733
harvesting, 1109, 1211
harvesting date, 797
heat-sum requirements, 52
herbicides, effect of
Agroxone, 97
CIPC, 942
IPC, 942
Weedone, 97
IAA oxidase activity, 730
in Algeria, 722
in Australia (New South Wales), 714
in Belgium, 1103
in Colombia, 1106
in Spain, 455, 1104
ion absorption, roots, 378*
irrigation, 1105, 1417
spray, 1349
sprinkler, 680
leaf, CO_2 fixation, 380*
leaf-area, -length, -width and dry-weight, 804
lodging, 1073
malting quality and fertilizers, 384
microclimate, 1388
mixtures, 34
moisture determination, 1014
mycorrhiza development, 379, 459
nutrition, 382, 383, 619, 634, 729, 730, 731, 778, 779, 1110 — see also fertilizers above
pests
armyworm (*Laphygma exempta*), 649
chafer grub (*Schizonycha* sp.), 649
eelworm (*Heterodera major*), 1417
frit fly (*Oscinis frit*), 55
plant population, 2
protein, 1107, 1196*
respiration, 778, 1195
roots
CO_2 fixation, 378*
ion absorption, 378*
mycorrhiza development, 379, 459
soil separation, 962
root/shoot ratio, 1007
rotations, 497, 583, 1341, 1342
salt tolerance, 921
seed
amino acid in, 376
dormancy-breaking, 723
excretions, 801
respiration losses and harvest date, 797
ripening, changes in, 797
shedding, 797
seed rate, 458, 645, 646, 1190
seed treatment, 54, 375, 458, 723, 724, 725, 726, 727
seedlings
cytochrome-oxidase content, 970
treatment, 724
sowing date, 453, 454, 719, 1190
spacing, 796
starch estimation, 461
stem population, 2
storage, 102, 1112*
terramycin, effect of, 966
tillering and soil structure, 2
undersown, 796
varietal classification, 1103
varietal identification, 1103, 1104
varieties, 714, 800
Ablyn....656
Abyssinian....656
Ackermann BJM 33 and 34....1023
Åsa....53, 280
Asplund....52
Atlas 46....300
Balder....649
Beorna....373, 454, 647, 1193
Bonneville....1190
Bonus....51, 56, 454, 1101, 1102, 1192
Bordia (Gembloux 456)....55
Busser....1101
Camton....34
Canadian Red Wonder....298
Carlsberg....293, 373, 797, 799, 1102, 1192
Carlsberg II....56, 1101
Cordova....374
Custer....1025
Dea (Engelen)....55, 1023
Dicktoo....1025
Domen....52, 797
Donaria....1102
Dore....53, 280
Edda....97
Edda I....53, 280
Edda II....53, 280
Elses....300
Engelen (Dea)....55, 1023
Etoile du Velay....1107
Firlbeck I....55
Flynn....656
Freja....51, 373, 646, 797
Frontier....1105
Funza....1106
Gembloux 456 (Bordia)....55
Glasnevin....454
Glasnevin 22....647
Gloire du Velay....1107
Gogotona de Carcastillo....455
Golden Archer....649
Golden Rain....972
Haisa....56
Haisa II....1101
Hannchen....1105
Heimdal....649, 797
Herse....52
Herta....52, 56, 293, 299, 454, 646, 647, 649, 797, 1023, 1101, 1102, 1192, 1193, 1195, 1417
HO2-17....797
HO2-18....797
HO2-73....797
Kearney....1025
Kenia....56, 644, 649, 1023, 1028, 1101, 1111
Kindred....54, 384
Maja....52
Manchuria....54
Mars....54, 384
Maythorpe....50, 644
Montcalm....54, 724
Moore....54, 384
No. 5....649, 1028
Olli....724
Opal....52
Otis....1025
Piroline....56, 1101
Plumage-Archer....1109, 1417
Pocha....1106
Ponote....1107
Prior....649
Proctor....51, 56, 373, 645, 646, 799, 1023, 1073, 1101, 1102, 1111
Provost....50, 644
Raspa....1106
Reno....1025
Research....1028
Rigel....1028
Rika....645
Riniker....1023
Spratt Archer....373, 454, 1111
Spratt Archer × Kenia....454, 1192
Spratt Archer × Kenia 22/11....293
Stella....280
Tenkow....374
Texan....374
Trebi....649, 1105, 1028
Tregal....1028
Varde....1195
Vega....53, 280
Velvon....649, 1028, 1190
Velvon BC 4-68....1025
Verde....52
Weihenstephan....1023
Wintex....374
Wis. 38....384
Wis. Barbless....54
Ymer....52, 97, 293, 299, 454, 646, 647, 649, 797, 1192, 119
ventilating system in, 969
water and growth, 731, 1078
weeds in
Brassica napus, 458
wild oats, 1370, 1417
wind damage, 1055
Barley grass, 675
Barley yellow dwarf, 1417
Baron — see Herbicides
Basutoland Dep. Agric. Rep. 1955, 141
Bavaria, agricultural advisory service, 567
Bayer — see Insecticides
Beans — see also Legumes
climate and yield, 94
defoliation, 1229
desiccation, 1229
fertilizer placement, 932
germination, 1011
irrigation (sprinkler), 680
leaching, 1389
methyl bromide, effect of, 649, 122

mixtures, 35
nutrition, 263, 634, 1389
pests
Aphis fabae, 840, 1417
beetles
Acanthoscelides obtectus, 126
Callosobruchus chinensis, 126
Phaseolus spp. varieties
Beurré d'Alger....1034
Colorado....1034
H.7....1034
H.32....1034
Ibundu....1034
Ph. angularis varieties
Colorado....1034
PA 010....1034
PA 011....1034
PA 014....1034
Ph. mungo as cover crop, 1035
Ph. radiatus
ascorbic-acid formation, 844
before cotton, 547
fertilizers, 649, 1028
germination, 481*
glutamic-acid metabolism, 481*
intercropped, 547
nutrition, 1233
rotations, 1342
seed treatment, 1011, 1227
soil-water use, 1027
sowing date, 840
spacing, 840
storage, 126, 649, 1011, 1227
talc and germination, 1011
Vicia faba
and 2,4-D, 599
before wheat, 1082
fertilizers, 842
germination, 839*
in Great Britain, R.A. p. 65
in Sicily, 842
nodulation, 841
plant population, 127
salt tolerance, 921
seed
carbohydrates in, 837,* 838,* 839,* 1231*
chemical composition, 836
size and yield, 127
seed production, 842
seed rate, 128
seed treatment, 129
sowing date, 127
spacing, 128
temperature, effect of, 129
varieties
Côte d'Or....1232
Minor....128
Niki....128
winterhardiness, 1232
V. faba var. *minor* before wheat, 1082
yellow mosaic virus, 1230
ean beetle (*Acanthoscelides obtectus*), 126
ean yellow mosaic virus, 1230
echuanaland Dep. Agric. Rep. 1954, 1033
ees and cotton, 1316
elgian Congo
cotton, 528
farming systems, 229
INEAC Rep. 1954, 1034
meteorological records, 1018*
rice, 424, 433
water hyacinth, 593
Belgium
seed exchange, 1048
sugar-beet, 1241
Bemisia gossypi-perda — see Whitefly
Berberis vulgaris, germination, 953
Bermuda grass (*Cynodon dactylon*), 82
soil-water use, 1027
Beta spp. — see also Fodder-beet, Mangels and Sugar-beet
nutrition, 979
wild, 1254, 1260
Betoxin — see Fungicides
BHC — see Fungicides and Insecticides
Bibliographies
land and water conservation in Europe, 586
land tenure, 316
millet and sorghum, 1161
Billbugs
Calendra callosa, 1131
C. maidis, 1131
Bindweed (*Convolvulus arvensis*), 1025, 1372
Blackarm (*Xanthomonas malvacearum*) — see Blight
Blackleg (*Erwinia carotovora*) — see Rots
Black root (*Aphanomyces cochlioides*), 853
Black rust (*Puccinia graminis*) — see Rust
Blight
Helminthosporium spp., 458
H. gramineum, 726, 727
H. sativum, 726
H. turcicum, 1129
Phytophthora infestans, 154, 155, 156, 499, 505, 506, 872, 1271, 1273, 1321
Xanthomonas malvacearum, 191, 899
Blissus leucopterus — see Chinch bug
Bollworm, 192, 654, 1030
Diparopsis perditor, 543
Heliothis armigera, 551
H. virescens, 538
Pectinophora gossypiella, 185, 537
Books
Addison, H. Land, water and food, 1043
Amaral, J. D. Potato storage, 1039
Azzi, G. Agricultural ecology, 1425*
Bahteev, F. H. Barley, 303
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Korsmo, E. Anatomy of weeds, 1430*
Korsmo, E. Weeds in present-day agriculture, 1429*
Millar, C. E. Soil fertility, 314
Minist. Agric., Fish., Fd England and Wales. Weather and the land, 1041
Mitsui, S. Inorganic nutrition, fertilisation and soil amelioration for lowland rice, 663*
Morgan, L. A plough on the mountain, 1042
Mouat, G. C. and Coleman, F. Tillage implements, 309
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Sømme, A. Geography of agriculture, Text and maps, 1423,* 1424
UNESCO. Arid zone programme, 310
U.S. Dep. Agric.
Diagnosis and improvement of saline and alkaline soils, 311
Water, 1044
Wild, H.
Common Rhodesian weeds, 1427
South Rhodesian botanical dictionary of native and English plant names, 1428*
Wishart, J. and Sanders, H. G. Principles and practices of field experimentation, 315
Zagoroff, Z. D. Agricultural economy of the Danubian countries 1935–45, 313
Zarov, D. K. Flora of the Ukraine, Vol. 6, 308
Bordeaux mixture — see Fungicides
Borneo (North), agricultural survey, 216
Botany, 659
Bracken, 613, 1417
Brassica spp.
swede/rape crosses, 1002*
weeds in, 675

B. arvensis — see Wild mustard
B. campestris var. *oleifera* — see Rape
B. napus— — see Rape
Brazil
Inst. Agrôn. do Sul, 290*
legumes, 132
maize, 1118
rotation experiment, 1416
soyabeans, 105
Brigalow (*Acacia harpophylla*), 950, 1035
British Guiana Dep. Agric. Rep. 1953, 1420
Bromus secalinus — see Cheatgrass
Brown linear spot (*Cercospora oryzae*), 1175
Buckwheat (*Fagopyrum esculentum*)
herbicides, effect of
CIPC, 942
IPC, 942
nutrition, 264, 634, 979
protein value, 324
rutin in, 33
Buda (*Striga hermonthica*)—see Witchweed
Bulb fly (*Leptohylemia coarctata*), 1417
Bulgaria, agricultural economy, 313
Bunt (*Tilletia* sp.) — see Smut
Buttercup (*Ranunculus repens*), 602
Button weed (*Cotula coronopifolia*),239, 240
Cajanus indicus — see Pigeon pea
Calcium in plants, 991*
Calcium arsenate — see Insecticides
Calcium cyanamide — see Defoliants and Herbicides
Calcium sulphamate — see Fungicides
Calendra spp. — see Billbugs
Callosobruchus chinensis — see Cowpea beetle
Calopogonium mucunoides, 232
Calotropis procera, 1083
Camber-bed cultivation, 579, 1028
Camel-thorn bush (*Alhagi camelorum*), 594
Cameroons
land use, 1338
millet, 766
sorghum, 766
Canada
insolation estimation, 1410
weeds, 598
Cane grass (*Phragmites communis*), 240
Cañihua (*Chenopodium pallidiculae*), 208
Canna glauca, 82
Cannabis sativa — see Hemp
Cape weed, 1422
Capsella bursa-pastoris, 1246
and 2,4-D, 599
Captan — see Fungicides
Carpet weed, 1370
Carthamus tinctorius — see Safflower
Cassava (*Manihot utilissima*)
chemical composition, 177
fertilizers, 889 — see also nutrition below
harvesting date, 1030
in Costa Rica, 889
nutrition, 1300,* 1301* — see also fertilizers above
nutritive value, 177
ridge v. flat cultivation, 649
spacing, 649
varieties
Alpin Valencia....649
Ankra....1419
Ankrah....1030
Binti Minsi....649, 1030
Bobby Hanson....651
Calabar....1419
Criolinha 750....1034
Eala Bitter 07....1034
Garri....1419
Local....1030
Masodi Sali....1034
Msitu....178, 650, 1030
No. 405/1....1030
No. 4674/4....178, 650
No. 4763/16....1027
No. 46106/26....178, 650, 1028
No. 46106/27....178, 650, 1027
No. 3744/E....1030
No. 4723A/26....1027
Queen....1419
Smalling....651
Williams....1419
Cassia floribunda, 1034
Castor-oil plant (*Ricinus communis*), 561, 1403
Catch crops
mustard, 47
rape, 47
rye, 47
sunflower, 913
sweet-potatoes, 650
Cathode rays and wheat germination, 691
Cation adsorption, plant roots, 965*
Cattails (*Typha* spp.), 947, 1368
Caustic soda — see Defoliants
CDAA, CDDA, CDEA, CDEC — see Herbicides
Centaurea picris, 1372
Cephus cinctus—see Wheat stem sawfly
Cercospora sp., 826
C. beticola, 1245
C. oryzae — see Brown linear spot
C. personata, 1034
Cercosporella herpotrichoides—see Eyespot
Cereals — see also individual crops
barn-drying, 294
choline in, 100
clipping, 1199
cobalt in, 1006
cold-resistance, 294
defoliation and lodging, R. A. p. 129
diseases, fungal 1197, 1417
drying, 101, 294
drying equipment, 1205
ethylene bromide, effect of, 102
fertilizers, 806, 1008, 1202,1343—see also nutrition below
fertilizer placement, 932, 1202
foliar diagnosis, 707*
freezing damage, 798
grazed, R.A. p. 129
growth, temperature, optimum for, 1199
herbicides, effect of
dinitrobutyl phenol, 648
DNOC, 248
MCPA, 648
2,4-D, 648
interchangeable types, 1200
lodging, 805, R.A. p. 129
mixtures, 1191
moisture-content determination, 80
1203, 1204
nitrogen/yield relationship, 707*
nutrition, 263, 805 — see also fertilizers above
pests
gall midges, 1045
mites, 1206
wireworm, 1275
photoperiodism, 1200
production and consumption, 306*
research, 1955, 294
rotations, 575
seed-drill for plot experiments, 809
seed production, 96
seed sampling methods, 457
seed treatment, 1275
seedling vigour, 1376
starch estimation, 99,* 461
storage, 103, 104, 294, 807, 808, 12
sugar-estimation method, 99*
temperature, 1199
varieties, 95,* 1194*
vernalization, 803, 1200
weeds in, 951
mustard, 648
sowthistles, 1359
winter injury, 1197
Ceresan — see Fungicides
Ceuthorrhynchus assimilis — see Weevils
Ceylon, pest control, 84*
Chad, sorghum, 763
Chafer grub (*Schizonycha* sp.), 649
Chara globularis, 297
Charlock (*Sinapis arvensis*), 644, 98
1302, 1422
Cheatgrass (*Bromus secalinus*), 13
Chenopodium album — see Fat hen
Ch. pallidiculae, 208
Ch. quinona, 208
Chickpeas (*Cicer arietinum*)
manganese in, 264
root/shoot ratio, 1007
Chickweed (*Stellaria media*), 644, 10
Chile, crops, nutritive values, 271
China mung (*Phaseolus radiatus*) — s
Beans
Chinch bug (*Blissus leucopterus*), 23
Chloris sp., 1029
Chloroxone — see Herbicides
Chondrilla juncea — see Skeleton we
Cibazol — see Growth substances
Cicer arietinum — see Chickpeas
CIPC — see Herbicides
Cirsium arvense — see Thistle
Citric acid, 561
Cl-IPC — see Growth substances
Climagram, 1017
Climate — see also Weather
and crop yields, 94
and plants, Finland, 1387
estimation of, 1017
world maps of atmospheric wate
vapour pressure, 665
Clover (*Trifolium* spp.)
herbicides, MCPA, 646
nucleic acid from leaves, 613
T. incarnatum, before wheat, 1082
T. pratense, nodulation, 485
T. repens var. as cover crop, 1115
Club-root (*Plasmodiophora brassica*
509
CMU — see Herbicides

Cocklebur, 816
Cocksfoot (*Dactylis glomerata*), 1368
Cocoyams
  Colocasia esculenta, 177
  Xanthosoma saggitifolium, 177
Colletotrichum atramentarium — see Hair-sprout
C. curvatum — see Stembreak
Colocasia esculenta — see Cocoyams
Colombia
  barley, 1106
  land tenure, 213*
  land use, 213*
  wheat, 365*
Colza (*Brassica napus* var. *oleifera*) — see Rape
Combine-harvester and weeds, 802
Commelina nudiflora, 1034
Commersoniana spp.—see Wild potatoes
Compositae, seed viability, 256*
Conoderus spp.— see Wireworms
Conserbeta — see Growth substances
Contour ridging, 1030
Convolvulus arvensis — see Bindweed
Copernate 50 — see Fungicides
Copper in plants, 267*
Copper oxide — see Fungicides
Copper oxychloride — see Fungicides
Copper sulphate — see Herbicides
Corchorus spp.— see Jute
Corn earworm (*Heliothis* spp.) — see Earworm
Costa Rica
  cassava, 889
  rice, 78,*
Cotton (*Gossypium* spp.)
  after lucerne, 533
  after *Phaseolus radiatus*, 547
  after soyabeans, 193
  agronomy, 304
  bolls, aborted ovules, 187
  boll-pruning, 902
  boll-shedding, 903
  border effects, 1322
  cross-pollination, 901
  cultivation, mechanical, 190, 193
  defoliation, 182, 891, 902, 1306
  desiccation, 1306
  diseases
    blight (*Xanthomonas malvacearum*), 191, 899, 1321
    wilt
      Fusarium solani, 1314
      Rhizoctonia sp., 543
  fallow hoeing, 297
  fertilizers, 189*, 191, 297, 542, 547, 757, 1008, 1028, 1029, 1305, 1320—see also nutrients below
  field experimental method, 548
  flat cultivation, 545
  flooding, 900
  flower production, 297
  fumigants, methyl bromide, 537, 649
  fungicides, effect of
    Agrosan, 1321
    Perecot, 544
  germination, 183, 893
  G. arboreum varieties
    C-7010....187
    C-7059....187
  G. barbadense
    citric acid in leaves, 188
    germination, 1309
    malic acid in leaves, 188
    seed treatment, 1309
    var. Pima S-1....1309
  G. herbaceum, reddening disease, 1315
  G. hirsutum
    citric acid in leaves, 188
    fertilizers, 1304
    flowering and climate, 541
    germination, 1309
    in India, 1304
    malic acid in leaves, 188
    sowing date, 1304
    spacing, 1304
    varieties
      Acala 4-42....1309
      BC-68....1304
      M.4....1304
      216-F....1304
      216-F/14....1304
      320-F....1304
      0394....1304
  G. paniculatum var. Batangas White 1307
  G. sturtii, 304
  G. thurberi
    germination, 1309
    seed treatment, 1309
  green manures, effect of, 300
  growth substances, effect of
    alpha-3-indolyl-butyric acid, 1318
    NAA, 547, 1318
    2,3,5-tri-iodobenzoic acid, 1318
  hard-seeded, 1309
  harvesting, 193
  herbicides, effect of 1310*
    Baron, 1313
    CIPC, 184
    CMU, 184, 895, 1312
    Dinoseb, 184
    MCPA, 1056
    2,4-D, 894, 1056
    2,4-DB, 1056
    2,4,5-T, 1313
  in Aden, 543
  in Belgian Congo (North), 528
  in California, 190
  in India, 532, 547, 654, 1304
  in Mozambique, 1432
  in Nigeria, 527
  in Nyasaland, 546
  in Philippines, 1307
  in Puerto Rico, 1308
  in Sudan, 544
  insecticides, effect of, 298, 580
    BHC, 186, 1028, 1320
    DDT, 186, 898, 1028, 1320
    Parathion, 898
  intercropped, 538, 547, 654
  irrigation, 193, 542, 582
  leaf-, bud- and fruit-pruning, 902
  lightning damage, 540
  lodging and defoliation, 182
  nutrients, 547, 1315, 1319 — see also fertilizers above
  pests
    aphids (*Aphis gossypii*), 896
    bollworm, 192, 654, 1030
      Diparopsis perditor, 543
      Heliothis armigera, 543
      H. virescens, 538
      Pectinophora gossypiella, 185, 537
    jassids, 654
    spider mites, 539
      Eotetranychus telarius, 897
    whitefly (*Bemisia gossypi-perda*), 898
  photosynthesis, 904
  plant population, 1321
  pollination by bees, 1316
  progeny row trials, 548*
  propagation by cuttings, 1317*
  rainfall effect of, India, 530
  rotations, 181, 297, 300, 531, 533, 654, 1029, 1063, 1146, 1274
  seed-coat nep, 192
  seed development, 187
  seed dormancy, 183
  seed production, 187
  seed-protein extraction, and use, 207
  seed rate, 193, 547, 654
  seed storage, 649
  seed treatment, 191, 297, 544, 899, 1321
  soil moisture, effect of, 1305
  sowing date, 192, 298, 528, 529, 545, 547, 1320, 1321
  spacing, 192, 193, 298, 300, 528, 545, 547, 1034, 1305, 1320, 1321
  storage, 537, 649
  thinning, 193
  tie-ridging, 191, 545
  varieties, 304, 547
    A 456....300
    A 619....300
    AB-3....543
    A-49-T....541, 535
    A-50-T....535
    Acala 4-42....193, 534, 892, 1309
    Acala-44....182, 1305
    Acala 1517C....892
    A × D....182
    African Upland....1420
    Albar 51-639....546
    Allen....535
    Allen-150....535
    Allen Zaria....535
    American Upland....1420
    Amsak....1308
    Bambesa 197....1034
    Banda II....541
    Bar 3....544
    Bar 7/8.1....544
    Bar 7/8.2....544
    Bar SP.84....297
    Bar XL-1....543, 544
    BC-68....1304
    BLR 14/25....544, 1420
    C 2....1034
    C.(50)17....649
    C-5406....187
    C-7010....187
    C-7059....187
    26 C....1321
    Coastland Sea Island....1308
    Coker 100....193
    Coker 100 W....534
    D & PL Fox....892
    Delfos 9169....534
    Deltapine TPSA....892
    Domains Sakel....544
    E....534
    Empire....193
    Empire Watson....892
    Gar....1034
    Gar 105....1034
    Giza 26....1314
    Hi-Bred....892
    Hyderabad Gaorani....532
    I-A170....536
    26I/25....1321
    Indore 2....654
    Indore 5....654

Karnak....1314
Laxmi....547
Locket....193
Lockett 140....892
M4....1304
Malvi 17....654
Miller 43.9.0....193
Montserrat Sea Island....1308
Mz 561....191
N17....1028
New Mexico Acala....193
N'Kourala....535
No. 1-71....182
No. 2G....534
No. 42-5....535
No. 44-10....535
No. 58-151....535
No. 138-F....187
No. 216-F....1304
No. 320-F....1304
No. 479-25....1321
No. 2106....300
No. 0394....1304
No. 7/367 × Albar 51....545
Odessa 7....904
Paymaster 54....892
Pima S1....182, 1309
Pima 32....1308
Rustro....300
S.47....649, 1028, 1320
Sakel....1420
Samaru 26C....527, 535, 1321
Samaru 26J....527
Sealand....1308
Ston 0/4....541
Stoneville 2B....193, 900
Stoneville 5....1034
Stoneville TPSA....892
Stormproof 1....892
Triumph....535
UK.48....191, 649, 1028
UK.51....191
UK.53....1320
X1730A....186, 297, 544, 902
weeds in, 1056, 1370
Acanthospermum hispidum, 894
Digitaria spp., 184
grass, 1368, 1371
Johnson grass, 1311
weeding and yields, 297
Cotula coronopifolia — see Button weed
Couch grass (*Agropyron repens*), 233, 234, 602, 1365, 1368, 1422
Cover crops, 1344
Calopogonium mucunoides, 232
Desmodium distortum, 1030
D. scorpiurus, 1421
Dolichos lablab, 938
Ladino clover, 1115
oats, 936
rye, 415
velvet beans, 1030
vetch, 415, 936
Veliveria zizanioides, 589
Covered kernel smut (*Sphacelotheca sorghi*) — see Smut
Cowpeas (*Vigna sinensis*)
as green manure, 300, 1035
varieties
Cristaudo....1035
D3....299
Giant....1035
Q 3134....1035
Q 3147....1035
Soutter....1035
Cowpea beetle (*Callosobruchus chinensis*), 126
Crabgrass (*Digitaria* spp.), 1370
D. sanguinalis, 1162
Crag I Herbicide — see Herbicides
Crambe abyssinica, 205
Creeping thistle (*Cirsium arvense*) — see Thistles
Crop(s) — see also Plants and individual crops
disease resistance, 1004*
evaluation, 1087
nutrition in England, 16th/17th century, 275*
testing technique, 1003*
Crop Protection Products Approval Scheme, Gt. Britain, 318
Crotalaria juncea — see Sunnhemp
C. spectabilis as green manure, 1030
Cucumis spp., 1403
Cumbungi (*Typha angustifolia*), 239
Cyamopsis psoraloides in rotation, 531
Cylas formicarius elegantulus — see Weevils
Cynodon sp.— see Quickgrass
C. dactylon — see Bermuda grass
C. plectostachyus — see African star grass
Cyperus rotundus — see Nutgrass
Czechoslovakia, wheat, 332
Dactylis glomerata — see Cocksfoot
Dahomey, groundnuts, 825
Dalapon — see Herbicides
Datura stramonium, 1403
DB granular, DCPA, DCU } see Herbicides
DD — see Fumigants and Insecticides
DDT — see Insecticides
Defoliant 713 — see Defoliants and Desiccants
Defoliants
calcium cyanamide, 107
caustic soda, 107
Defoliant 713, 1306
Golden Harvest, 891
Magron, 1229
monosodium cyanamide, 182
S.E.X., 891
Shed-a-leaf, 891
sodium pentachlorophenolate, 107
Delsan A-D — see Fungicides
Denmark, State Exp. Serv. Pl. Cult., varieties approved, 279
Deschampsia caespitosa, 602
Desiccants, 1374
Defoliant 713, 1306
Dinoseb, 395
Golden Harvest, 891
Magron, 1229
MCA, 1228
PCP, 395
Desmodium distortum as cover crop, 1030
D. scorpiurus, 1421
Diabrotica balteata — see Banded cucumber beetle
D. undecimpunctata howardi — see Southern corn rootworm
Diatomite — see Insecticides
Diazinon — see Insecticides
Dictionaries — see Books
Dieldrin — see Insecticides
Diesel distillate — see Herbicides
Diethyl dithio carbamate, 1080
Dif — see Herbicides
Digitaria spp., 184, 1370
D. exilis, 1005, 1162
D. iburua, 1162
D. sanguinalis, 1162
Dinoseb — see Herbicides
Dioscorea spp., 524 — see also Yams
Diparopsis perditor — see Bollworm
Diplotaxis tenuifolia — see Sand rocke
DNBP — see Herbicides, Dinoseb
DNOC — see Herbicides
DNOIPP — see Herbicides
DNOSBP — see Desiccants and Herbicides, Dinoseb
DNP — see Herbicides
DNT — see Growth substances
Dock, 675
Dolichos lablab
as cover crop, 938
as green manure, 794
botany, 845*
varieties
Black S.A.O.....1028
Brown S.A.O.....1028
White Tambush....1028
Dredge corn, 1191
Dura — see Sorghum
Dwarf bunt (*Tilletia brevifasciens*) — see Bunt
Earworm
Heliothis armigera, 416, 762*
H. obsoleta, 754
East Africa — see Africa
Echinochloa colonum, 82
E. crus-galli, 852, 942
E. crus-pavonis, 82
E. frumentacea — see Millets
Ecological survey, Australia (Victoria) 574
EDTA, 611
Eelworm (*Heterodera* spp.), 1274
H. göttingiana, 133
H. major, 1417
H. marioni, 906
H. rostochiensis, 509
EF 980 M — see Herbicides
Egypt
maize, 386
rice, 1163
wheat, 676
Eichhornia crassipes — see Water hyacinth
Elasmopalpus lignosellus — see Lesse cornstalk borer
Eleocharis acuta — see Rushes
Eleusine coracana — see Millet
E. indica, 1128
Encyclopaedia — see Books
Endothal — see Herbicides
Endrin — see Insecticides
Eotetranychus telarius — see Spide mite
Equisetum arvense, 602, 694
Eragrostis abyssinica — see Teff
E. curvula in rotation, 1274
Erbon — see Herbicides
Ergot, 1098
Erinose (*Eriophyes hibisci*), 199
Erosion — see Soil and water conservation
Erwinia spp.— see Rots
Ethylene bromide — see Fumigants
Ethylene dibromide — see Fumigants
Etoxyl — see Herbicides
Euphorbia spp., 1371

E. esula, 1361
E. lathyrus, 1335
Europe — see also individual countries
barley trials, 56
Digitaria spp., 1162
fertilizers, 277*
soil and water conservation, 586
European corn borer (*Pyrausta nubilalis*), 753
Evaporation from bare and cropped soil, 934
Evapotranspirometer, 610
Eyespot (*Cercosporella herpotrichoides*), 348, 1072, 1073
Fagopyrum esculentum—see Buckwheat
Fall armyworm (*Laphygma frugiperda*) — see Armyworm
Fallow, chemical, 1346
FAO
Agricultural Division, 289*
land tenure bibliography, 316
Farm transport, Switzerland, 288
Farming systems, 1432
Belgian Congo and Ruanda-Urundi, 229
Nigeria, 576,* 926*
Sierra Leone, 296
stubble mulching, 937,* 1032
Switzerland, 922
Fat hen (*Chenopodium album*) 694, 1091, 1302
Ferbam — see Fungicides
Ferrous sulphate and soil-manganese deficiency, 1096
Fertilizers, 276* — see also individual crops
in Europe, 277*
in Germany (West), 223
Field experimental method
analysis of data, 282,* 283, 642,* 643, 1415, 1416
border-row effects, 810, 1322
experimental design, 1019*, 1431*
field experimentation, 315
in Germany, 1020*
progeny rows, cotton, 548
rice sampling, 1189*
variety comparison, 281
Filipendula ulmaria, 602
Fimbristylis miliacea, 82
Finger millet (*Eleusine coracana*) — see Millet
Finland, climate and plants, 1387*
Flame photometry for calcium determination in plants, 992*
Flax (*Linum usitatissimum*)
before sugar-beet, 856
boll-stripper, portable, 1325
diseases
Alternaria linicola, 560
Fusarium spp., 560
Polyspora lini, 549
germination, 552
herbicides, effect of
Agroxone, 553
CMU, 233
IPC, 233
Weedone, 553
morphology, 905*
nutrition, 264, 619, 624, 985, 1417
pests
Heliothis armigera, 551
Plusia nu, 551
phytin distribution in, 552
seed production, 1323
seed treatment, 549, 560
varieties
Cascade....549
Concurrent....550
Fivel....550
Formosa....553
Hareskovgaard 75....549
Herkules....553
Hollandia....550
Liral Crown....550
Liral Monarch....550
Liral Prince....550
Liral Sussex....549
Noblesse....550
Øtofte L.356....549
Percello....549
Priekulu Linija 665....549
Rembrandt....550
Solido....550
Stormont Cirrus....549
Stormont Gossamer....292, 549
Stormont Morley....292
Ventnor....302
Wiera....550
weeds in, 951, 1370
foxtail, 1324
wild mustard, 1323
wild oats, 1370
Flora
Africa, 671
Australia, 1432
India, 1432
USSR, 307,* 308*
Flour beetles
Tribolium castaneum, 1085
T. confusum, 711, 1085
Fodder-beet (*Beta vulgaris*)
Conserbeta, effect of, 1417
double cropping, 1351
earth-cube cultivation, 1351
fertilizers, 142, 292—see also nutrition below
hedge windbreak, effect of, 1355
herbicides, effect of, 1373
CMU, 233
in Norway, 494
in S. Africa, 300
in S. Rhodesia, 139
nutrition, 270, 619, 1249—see also fertilizers above
roots, dry-matter distribution in, 864
seed treatment, 1275
singling implement, 1258
sprout inhibition, 144
storage, 143, 144, 1417
varieties, 495*
Barres Øtofte....864
Barres Strynø....494
Corona....141
Daehnfeldt....494
Gul Daeno XI....494
Gul Øtofte X....647
Hinderupgaard....140
Hunsballe....144
Hunsballe IX....647
Hunsballe X....140, 864
Hunsballe XI....494
Hvid Øtofte XI....494
Ovana....141
Pajbjerg Korsroe XI....494
Pajbjerg Rex X....140, 143
Pajbjerg Rex XI....494
Pajbjerg X....140
Red Øtofte....864
Red Øtofte X....647
Rosa Beta....141
Strubes BK....141
Svalöfs Solid....494
Triumf....647
Weibulls Triumf....494
Zentaur....141
wireworm, 1275
Fodder sugar-beet — see Sugar-beet
Foliar diagnosis, 707*— see also individual crops
Foliar nutrition, 636 — see also individual crops
Foliar spraying, 5 — see also individual crops
Fonio (*Digitaria exilis*), 1005, 1162
4-chlorophenoxyacetic acid — see Herbicides
4-(phenoxy) butyric acid — see Herbicides
Foxtail (*Alopecurus* spp.), 1370
A. geniculatus, 80
France
Inst. Nat. Rech. Agron. Rep. 1952, 1953, 295, 648
Jerusalem artichoke, 1303
rape, 916,* 1330
rice, 767
French Africa — see Africa
Frit fly (*Oscinis frit*), 55
FTE, 667, 1413
Fumaric acid, 561
Fumigants
DD, 351
E.D.B., 1274
ethylene bromide, 102
ethylene dibromide, 103, 351, 1086, 1274
mercury vapour, 364
methyl bromide, 474, 537, 649, 1028, 1227
phosphine, 1206
Fumitory, 644
Fundi (*Digitaria exilis*), 1005, 1162
Fungicides, 727, 1411
aerial spraying, 581
phytotoxicity, 347
specific
Agrimycin 100, 875
Agrosan, 70, 191, 297, 1321
Agrox, 347
Anticarie, 347
Arasan, 69, 560, 813, 828
Betoxin, 560
BHC, 1417
Bordeaux mixture, 1023, 1034, 1245, 1271
Captan, 871, 1132, 1417
Ceresan M....347
Copernate 50....506
copper oxide, 1034
copper oxychloride, 1245
Delsan A-D, 828
ethyl mercury phosphate, 1417
Ferbam, 871
MENA, 899
Mergamma, 1417
Nabam, 871
Ortho Seed Guard, 828
Panogen, 363, 560, 726
Panogen 15, 347
pentachlornitrobenzene, 49
Perenox, 191, 826
Phygon, 765, 871
Phygon XL, 70
R1489, 899

sodium sulphanilate, 98
Spergon, 191, 375, 726, 813, 1225
sulphuric acid, 1321
tetramethyl thiuram disulphide, 745
Thiram, 70
TMTD, 483
tribasic copper sulphate, 1271
Zineb, 1034
with silicone lubricants, 828
Fungicide-insecticide, BHC-TMTD, 297
Fusarium spp.— see Wilt
Galeopsis spp. — see Hemp nettle
Gall midges, 1045*
Germany
fertilizer trials, 223
field experimental method, 1020*
Jerusalem artichoke, 1303
lupins, 847
maize, 397
peas, 847
plant disease, warning service, 1015
seed-potatoes, 504
Germination, 257, 1122, 1375—see also crops
capacity, 1376
estimate
brickdust method, 456
TTC method, 256,* 456
fertilizers, 1202
Germisan — see Insecticides
Gibberella zeae, 1126
Gibberellic acid — see Growth substances
Gingelly (*Sesamum indicum*) — see Sesame
Glutamic acid in *Phaseolus radiatus*, 481*
Glycine soja — see Soyabeans
Glycollic acid, 561
Gold Coast Dep. Agric. Rep. 1953–4, 1419
Golden Harvest — see Defoliants and Desiccants
Gorse, 675
Gossypium spp.— see Cotton
Gram (*Phaseolus radiatus*) — see Beans
Granary weevil (*Sitophilus granarius*) — see Weevil
Great Britain
agricultural economics, Wales, 566*
agricultural land lost, 210
agricultural research centres
Cambridge Sch. Agric. experiments, 1000
Colon. Agric., Anim. Health, For. Res. Cttee Rep. 1954–5, 1406
Colon. Prod. Coun. Rep. 1954–5, 1407*
Edinb. E. Scot. Coll. Agric. Rep. 1955, 1021
Emp. Cott. Gr. Corp. Rep. 1953–4 and 1954–5, 192, 193, 1320, 1321
Grassl. Res. Inst. experiments 1956, 1404*
Hasler and Co., Ltd. Rep. 1953–4, 645
Home Grown Threshed Peas Joint Cttee Rep. 1954, 1228
Jealotts Hill Res. Sta. experiments 1956, 1405*
NAAS experiments 1954–5i 631,* 632*
Nat. Veg. Res. Sta. Rep. 1955, 1261
NIAB cereal seed multiplication, 96
Norfolk Agric. Exp. Sta. Rep. 1954-5, 644
Rothamsted Exp. Sta. Rep. 1955, 1417
beans (*V. faba*), R.A. p. 65
cereal varieties for Cambridgeshire, 1194*
coastal floods, 1953, 921
crop nutrition in 16th/17th century, 275*
Crop Protection Products Approval Scheme, 318
farms, number and type, Wales, 566*
fertilizer practice, 932
land reclamation, Wales, 1042*
meteorological services, 1041.
peas, 827*
rape seed for oil extraction, 917
rye for spring grazing, Wales, 720
sugar-beet trials 1955, 1240
weeds, 675, 1040
wind erosion, Fens, 585
Greece, crop trials 1952–4, 1001*
Green gram (*Phaseolus radiatus*) — see Beans
Green manures, 132, 317, 412, 792, 825, 1421
Calotropis procera, 1083
cowpeas, 300, 1035
Dolichos lablab, 794
kudzu, 1141
lupins, 497
millet, 771, 930
pigeon peas, 794
Sesbania aculeata, 1421
sorghum, 771
soyabeans, 794, 1032
sunnhemp, 300, 1030
velvet beans, 299, 300
vetch, 856
Grey speck, oats, 1226
Groundnuts (*Arachis hypogaea*), 296— see also Legumes
C.G.O.T. Scheme, 1217
deamidase enzyme system in, 472
defloration, 824
diseases
Cercospora leaf spot, 826, 1034
rosette, 116*
fertilizers, 473, 825, 1029, 1220, 1221 — see also nutrition below
flowering, 1034, 1219*
foliar diagnosis, 1220, 1221
fruit formation, 118, 822,* 1218
fumigants, methyl bromide, 474, 649
germination, 114, 296, 1011, 1223
-hay as mulch, 938
herbicides, effect of
MCPA, 1056
2,4-D, 1056
2,4-DB, 1056
in Africa, 825, 927
in Mauritius, 1216
in South Africa, 470
intercropped, 547, 654
irrigation, 471
manganese toxicity, 120
mulched, 938
nodulation, 119
nutrition 757, 825, 1221, 1222 — see also fertilizers above
osmotic pressure in, 112, 113
oxo acid in seedlings, 117*
pests
Aphanus sordidus, 825
banded cucumber beetle (*Diabroticabalteata*), 819
lesser cornstalk borer (*Elasmopalpus lignosellus*), 819
southern corn rootworm (*Diabrotic undecimpunctata howardi*), 81
weevil (*Pachymoerus cassiae*), 82
wireworm (*Conoderus* sp.), 819
photoperiodism, 113
plant population, 825
pods, empty, 1027
protein extraction and use, 207
reproduction, 821
rotations, 452, 654, 771, 927, 1027 1029, 1146, 1274, 1345
seccos, 825
seed density, 115
seed rate, 115
seed treatment, 297, 1011
-shells, 475, 938
shelled v. unshelled, 114, 296
soil-water use, 1027
sowing date, 824, 826, 1032, 1216
sowing depth, 1034
sowing seed or pods, 1034
spacing, 1034
starch content, 1396
storage, 474, 649, 825, 1011, 1223
tie-ridging, 1028
varietal classification, 820
varieties
A65....1034
A1055....1034
AE59....1034
Bambey 28.206....825
Barberton....826
Chimbuwila....826
Egyptian Giant....470
Gambia....826
Gudiyathum Bunch....1033
Improved Spanish....1033
Indian Coromandel....299, 1032
Jumbo Runner....118
Kenyoma....1027
Kolasaba....296
Koniagui....825
Konkodugi....296
Maras....296
Mbanya....296
Mgogo....1030
Mwitunde....826, 1027
Natal Common....470, 826, 121
Nikile....296
No. 28.206....115
No. 28.206 Boulel....825
No. 28.206 SAG....825
No. 28.207 Bambey....825
No. 31-33....115
No. 43.G.348....1033
SA/A2 Masambika....826
SA/A6....826
S/A4 Jur....826
Satema....296
Soudan 28.206....825
Spanish....820
Spanish Bunch....826
Tiga....825
T.M. V1....114

T.M. V2....114
T.M. V4....471
U/A8....826
U/A18....826
U/A29....826
U/A35....826
U/A36....826
U/A39....826
U/A40....826
U/A41....826
Valencia....299, 820, 1030, 1032
Virginia....820
Virginia Bunch....299, 470, 1032
vegetative reproduction, 823
weeds in, 301, 1056, 1370, 1371
Growth substances — see also Herbicides
alpha-3-indolyl-butyric acid, 1318
Cibazol, 1068
Cl-IPC, 518
Conserbeta, 1417
DNT, 885
gibberellic acid, 125, 625
IAA, 125, 358, 557, 625, 626, 915, 1402*
IBA, 161
IPC, 885, 1295
Irgafen, 1068
maleic hydrazide, 144, 168, 733, 863, 885, 1259,* 1294, 1295, 1417
MENA, 168, 1295
METER, 1295
NAA, 358, 547, 816, 915, 1068, 1318
naphthalene derivatives, 273
polyoxyanthraquinone, 46
potassium indole acetate, 870
Pu, 1295
Rindite, 874, 1023
sulphaguanidine, 1068
TCNB, 885, 1295
2,3,5-tri-iodobenzoic acid, 1318
2,4-D, 358, 1069, 1402*
2,4,5-TCPP, 161
2,4,5-TP, 903
3-amino-1,2,4-triazole, 959*
Guara (*Cyamopsis psoraloides*), 531
Guiana
Dutch, rice, weeds in, 82
French, rice, 1177*
Guinea
French
millet, 766
sorghum, 766
Portuguese
groundnuts, 927
sorghum, 927
Guinea corn (*Sorghum vulgare*) — see Sorghum
Guinea grass (*Panicum maximum*), chemical composition and fertilizers, 635
Guizotia abyssinica, 297
Hail — see Weather
Hair-sprout (*Colletotrichum atramentarium*), 1277
Haiti, agriculture in, 1036*
Hanane — see Insecticides
HD-160, 1132
Head smut (*Sorosporium reilianum*) — see Smut
Heart's-ease (*Viola tricolor*), 1091
Hedronal — see Herbicides
Helianthus annuus — see Sunflower
H. tuberosus — see Jerusalem artichoke
H. tuberosus × *H. macrophylla* — see Topine
Heliothis spp.—see Bollworm and Earworm
Helminthosporium spp.— see Blight
Hemp (*Cannabis sativa*), 1403
fertilizers, 194
in Spain 194,
irrigation, 194
seed production, 194
seed rate, 194
sowing date, 194, 297
spacing, 194
var. Fatsa....194
Hemp nettle (*Galeopsis* spp.)
G. pubescens, 1362
G. tetrahit, 1362
Heptachlor — see Insecticides
Herbage plants, nomenclature, 319
Herbicides, 238, 956, 1373, 1411 — see also Growth substances
aerial spraying, 675, 960*
application rate and penetrative power, 245
compatible and incompatible spray-combinations, 951
inactivated by seed treatment, 954
persistence in soil, 244, 958
specific
Agroxone, 97, 153, 553
alpha-chloroacetamides, 1371
ammonium dinitrophenate, 399
aromatic solvents, 297
arsenic pentoxide, 594
Baron, 1313
calcium cyanamide, 80
CDAA, 1369, 1370
CDDA, 1370
CDEA, 1370
CDEC, 644, 1370
Chloroxone, 452
CIPC, 108, 184, 244, 895, 942
CMU, 184, 233, 240, 244, 752, 895, 958, 1243, 1312, 1364, 1422
copper sulphate, 297
Crag I Herbicide, 1132
Dalapon, 243, 852, 854, 943, 947, 1244, 1311, 1368
DB granular, 1372
DCPA, 346
DCU, 863
diesel distillate, 239
Dif, 153
Dinoseb, 82, 108, 184, 248, 395, 829, 895, 1213, 1228, 1374
DNC 1374
DNOC, 82, 247, 248
DNOIPP, 1228
DNP, 648, 1080
EF 980M, 239
Endothal, 752, 862
Erbon, 1313
Etoxyl, 1172
4-chlorophenoxyacetic acid, 830
4-(phenoxy) butyric acid, 1374
Hedronal, 1362
Herbisan, 603
IPC, 233, 644, 863, 942
Karmex D, 895
Karmex W, 1172
Lion Herbicidal Oil No. 1, 108
M52, 1362
MCPA, 82, 153, 297, 301, 346, 372, 436, 646, 648, 693, 750, 1056, 1091, 1128, 1172, 1364, 1374
MCPB, 242, 829
Methoxone, 153
N-1-naphthyl phthalmic acid, 108
N,N-diallyl-alpha-chloroacetamide, 1371
NPA, 244
PCP, 82, 108, 395, 644, 862
petroleum naphthas, 239
Phenoxylene 30, 452
Raphatox, 1362
RD 4236, 651
Shell No. 30, 1363
Shell *Salvinia* Weedkiller, 948
Silvex, 947
sodium arsenite, 82
sodium borate, 1372
sodium chlorate, 233, 602, 953, 1025
sodium nitrate, 644, 1374
sulphuric acid, 1302, 1374
TCA, 30, 71, 234, 240, 244, 644, 675, 752, 854, 862, 863, 955, 1172, 1243, 1346, 1365, 1422
TCA 90, 236
Triacide, 248
Tributon, 526
Tripastide, 248
Tropotox, 664
2,2,3-trichloropropionic acid, 854
2,3,5-tri-iodobenzoic acid, 409*
2,4-D, 82, 108, 109, 153, 161, 172, 239, 240, 244, 297, 301, 399, 596, 599, 600,* 601, 648, 651, 653, 693, 750, 752, 894, 915, 949, 957, 1034, 1035, 1056, 1070, 1172, 1214, 1215, 1294, 1323, 1364, 1368, 1372, 1374, 1417, 1418, 1422
2,4-DB, 1056
2,4,5-T, 82, 161, 298, 594, 651, 830, 947, 950, 1034, 1035, 1313, 1366, 1367, 1422
3,4-D, 830
U46, 1362
UD-55, 1172
Weedone, 97, 553
sprayer, variable dosage, 246
volatility, 675
Herbisan — see Herbicides
Heterodera spp.— see Eelworm
Hibiscus spp., erinose (*Eriophyes hibisci*), 199
H. cannabinus — see Kenaf
H. sabdariffa — see Roselle
Hordeum spp.— see Barley
Hungary, agricultural economy, 313
Hydrofluoric acid gas and plants, 998
Hylemya spp.— see Seed-corn maggots
Hymenachne amplexicaulis, 1420
Hyptis spicigera, 297
IAA, IBA } see Growth substances
Imperata cylindrica, 1345
India
Agric. Res. Inst. Delhi, 321, 329
Cent. Cott. Cttee Rep. 1954, 547
Cent. Jute Cttee Rep. 1954–5, 906, 907
Cent. Rice Res. Sta. Rep. 1952–3, 452
cotton, 547, 654, 1304
and rainfall, 530

flora, 1432
Gaorani Cotton Improvement Scheme, 532
jute, Bengal (West), 195
millet, 1161
plant dictionary, 305
rice, 430, 435
sorghum, 1161
weed control, 241
Indicator plants, 310
Infra-red absorption recorder, 1395
Insecticides, 538, 1411
aerial spraying, 580, 581
specific
Agricide 25, 825
Aldrin, 173, 292, 496, 523, 649, 747, 761, 814, 819, 887, 1023, 1028, 1131
aluminium pentasilicate, 126
Aramite, 539
Arbitex, 1275
Bayer 4632, 1247
Bayer 4633, 1247
Bayer 17147, 185
BHC, 186, 192, 351, 654, 747, 761, 825, 840, 1028, 1401, 1420
calcium arsenate, 887
Captan, 747, 814
Chlordane, 173, 747, 761, 887, 1420
DD, 906
DDT, 126, 185, 186, 192, 298, 351, 580, 649, 654, 747, 754, 898, 1028, 1130, 1417
Diatomite, 126
Diazinon, 814, 1023
Dieldrin, 23, 173, 654, 747, 761, 814, 819, 1028, 1417
Endrin, 23, 192, 551, 649, 654, 761, 1075, 1417
ethyl mercury phosphate, 644
ethylene dibromide, 1086
Germisan, 1275
Hanane, 1417
Heptachlor, 496, 747, 761, 814
Isodrin, 761
Isolan, 1023
kaolin, 126
Lindane, 126, 169, 173, 747, 761, 814
Malathion, 761, 1023
Mergamma, 644
Metasystox, 840, 1247, 1417
N.C.7, 1417
nicotine, 840
Ovotran, 539, 897
Parathion, 199, 350, 761, 840, 896, 898, 1417
Pestox 3, 199
Piroxvariante, 1023
pyrethrum/piperonyl butoxide, 761, 1028
Ryania, 761
silica, 126
Strobane, 761
Sulfenona, 539
sulphur, 199
Systox, 539, 840, 897, 1247, 1417
Thiram, 747
Toxaphene, 564, 819
Insolation — see Weather
Internal brown spot, potatoes, 157
Ion-exchange resins, 1110
IPC — see Growth substances and Herbicides
Ipomoea batatas — see Sweet-potatoes
I. involucrata, 1034
Ireland
Northern
Agric. Res. Inst. Rep. 1954–5, 646
Minist. Agric. Res. Exp. Rec. 1952–3, 292
Republic of
Dep. Agric. Fld Exps. 1952, 647
Minist. Agric. Rep. 1953–4, 1954–5, 140, 293, 1022
Irgafen — see Growth substances
Irrigation — see also individual crops
in America, 582
in Europe, 586
in Italy, 321
in Oklahoma, 931
in Rhodesia (South), 924
Swaziland Irrigation Scheme, 770
Ischaemum rugosum, 82
Isodrin } see Insecticides
Isolan }
Isotopes (radioactive), 661*
iron, 268*
phosphorus, 356, 963, 981, 994*
radiocarbon dioxide, 254
Israel
Arid Zone Res. Inst., 1054
rotations, 575
Italy
beans, Sicily, 842
cereal varieties, 95*
hail control, 584, 1053
irrigation, 321
rice, 429
sugar-beet, 137, 486
weeds, 250
wheat, 323, 337, 1052
Jamaica Dep. Agric. Investigations 1953, 651
Japan
potatoes, 145
rice, 77, 425, 1174
sweet-potatoes, 171
Jassids, 654
Jerusalem artichoke (*Helianthus tuberosus*)
eelworm resistance, 526
in France, 1303
in Germany, 1303
in USSR, 179
photoperiodism, 1303
var. Küppers Rote Zonenkugel.... 180
Johnson grass (*Sorghum halepense*), 945,* 1311
Jowar (*Sorghum vulgare* — see Sorghum
Juncus articulatus — see Rushes
Jussieua spp., 82
Jute (*Corchorus* spp.), 907
chemical composition and growth stage, 554
C. capsularis, 1326
fertilizers, 555
in India, 195
C. olitorius, 1326
fertilizers, 555
in India, 195
var. ECR576....297
diseases, 1326
stem canker, 1421
fertilizers, 555, 906
fibre and fertilizers, 906
in India, 195, 1326
in Pakistan, 1326
lignin in, 554
morphology, 906
pests, 1326
eelworm (*Heterodera marioni*), 906
photoperiodism, 906
salt resistance, 906
seed, 196*
sowing date, 906
varieties, 1326
ECR576....297
Segama....1421
vernalization, 906
Kaffircorn (*Sorghum vulgare*) — see Sorghum
Kalanchoe blossfeldiana, 967
Kale (*Brassica oleracea*)
leaf-area index, 1417
nucleic-acid from leaves, 613
salt tolerance, 921
weeds in, 951
charlock, 1302
fat hen, 1302
redshank, 1302
Kaolin — see Insecticides
Karmex — see Herbicides
Kenaf (*Hibiscus cannabinus*)
Agrilus acutus, 907
fibre and growth stage, 652
harvesting date, 198
in Philippines, 1327
in Rhodesia and Nyasaland, 1031
irrigation, 197
seed rate, 907
sowing date, 197, 198
spacing, 197
varieties
Cuban....1031
Egyptian....1031
El Salvador....198, 652
Hibiscus ex S.A.....1031
Indian....1327
IX-114....1327
IX-138....1327
Laos....1030
Rosella....1031
Kentucky bluegrass (*Poa pratensis*), 1368
Kenya
camber-bed system, 579
Dep. Agric. Rep. 1953 and 1954, 649, 1028
maps, 1026
vlei soils, 579
weeds, 1367
Kikuyu grass (*Pennisetum clandestinum*), 1035
Knotgrass (*Polygonum aviculare*), 644, 1091
Kodra (*Paspalum scrobiculatum*), 1154
Korali (*Setaria pallidifusca*), 497
Korea (South)
agriculture, 662*
rice, 772*
Krilium and sugar-beet, 863
Kudzu
Pueraria phaseoloides, 635
P. thunbergiana, 1141
Land classification, 211
Land planning, USSR (Kazahstan), 215*
Land reclamation, 586, 1043
Europe, 586
New South Wales, 950
New Zealand, 675
Queensland, 950
Wales, 1042*

Land tenure, 316
  Bavaria, 567
  Colombia, 213*
Land use
  Africa, 925
    East, 1026
  Bavaria, 567
  Cameroons, 1338
  Colombia, 213*
  Guinea (Portuguese), 578
  Sudan, 570*
  Switzerland, 922
  USSR, 923
  Zanzibar, 212
Lantana camara, 298, 1366
Laphygma spp.— see Armyworm
Late blight (*Phytophthora infestans*)— see Blight
Lathyrus indicus, chemical composition and fertilizers, 635
LE-45, LE-46 } see Fungicides
Leaf-area index, 359
Leaf roll, 1023, 1417
Leaf spot
  Cercospora spp., 348, 826, 1034, 1072, 1073, 1175, 1245
  Pseudomonas sesami, 908
Leafy spurge (*Euphorbia esula*), 1361
Legumes — see also individual crops
  anatomy, 846
  as green manure, 132
  germination and vitamin B_{12}, 134*
  nodulation, 119, 132, 467, 485, 1225, 1384
  rotations, 575
  seedling vigour, 1376
  soil and water conservation, 132
Lentils (*Lens* spp.) before wheat, 1082
Leptochloa scabra, 82
Leptohylemia coarctata — see Bulb fly
Leptosphaeria salvinii — see Rots
Lesser cornstalk borer (*Elasmopalpus lignosellus*), 819
Libya, wheat, 339
Lightning — see Weather
Lignin, 266*
Limonius canus — see Wireworms
Linaria vulgaris, 237
Lincoln weed (*Diplotaxis tenuifolia*) — see Sand rocket
Lindane — see Insecticides
Linseed (*Linum usitatissimum*)
  diseases
    Alternaria linicola, 560
    Fusarium spp., 560
  fumigants, methyl bromide, 649
  germination, 561
  growth rate, 911
  herbicides, effect of
    Agroxone, 553
    CIPC, 942
    IPC, 942
    Weedone, 553
  in Queensland, 1337
  oil content and seed characters, 910
  organic acids in, 561
  protein extraction and use, 207
  seeds, BHC absorption, 1401
  seed-coat colour and associated characteristics, 909
  seed treatment, 560
  sowing date, 911
  varieties
    Klein....300
    Ottawa 770 B....911
    Ottawa 3693 A....911
    Punjab....655
    Punjab 5....302
    Punjab × Walsh....302
    Raja....911
    Redwing....911
    Redwood....911
    Safedak 5288....910
    Udžen 5296....910
    Valuta....553
    VIR 1650....910
    VNIIMK 5237....910
    Walsh....300, 302, 655
  weeds in, 951
  grass, 1371
Linum usitatissimum — see also Flax for fibre, Linseed for oil
  nutrition, 979
  seed treatment, 954
Lion Herbicidal Oil — see Herbicides
Loose smut (*Ustilago nuda*) — see Smut
L.T. — see Herbicides
Lubia — see *Dolichos lablab*
Lucerne
  roots, saponin excretion, 533
  rotations, 1341
Lupins (*Lupinus* spp.)
  as green manure, 497
  L. albus
    defoliants, effect of, 107
    growth, 1234,* 1235
    in Poland, 482
    nutrition, 985
    seed production, 1236
    seed treatment, 1235
    seedling physiology, 253
    sowing date, 1235, 1236
    varieties
      Pflug's Gela....1235
      Przebendowo....482
      Terra....300
  L. angustifolius
    defoliants, effect of, 107
    seed production, 1236
    sowing date, 1236
    var. S.E. Blou No. 1....300
  L. luteus
    seed production, 1236
    sowing date, 1236
    var. S.E. Geel No.1....300
  L. termis in Sudan, 131
  nutrition, 295, 619, 634
  rotations, 497
  var. Bitter White....1030
M52 — see Herbicides
Madar (*Calotropis procera*), sowing date, 1083
Magnesium determination in plants, 991*
Magron — see Defoliants and Desiccants
Maize (*Zea mays*)—see also Cereals
  after grass, 1030, 1140
  after kudzu, 1141
  amino-N in germinated seed, 406
  -breeding, USA, 385
  chemical composition, 270, 295, 406, 740, 749, 1005
  climate, effect of, 1123
  cold resistance, 405, 1127
  continuous cropping, 1120, 1121
  detasseling, 299, 1116
  diseases, 402
    blight (*Helminthosporium turcicum*), 1032, 1129
    Gibberella zeae, 1126
    Pythium sp., 1126
    P. debaryanum, 746
    rust (*Puccinia polysora*), 400, 401, 1027
    smut (*Sorosporium reilianum*), 70
    Stewart's wilt (*Bacterium stewartii*), 1132
  double cropping, 1351
  drills, direction of, and yields, 396
  drought, effect of, in Brazil, 1118
  ear, diseases of, 402
  ear drying, 395
  ear, moisture content, 1142
  earth-cube cultivation, 1351
  evapotranspiration, 1136
  fertilizers, 72, 295, 400, 412, 734, 737, 739, 740, 757, 759, 760,* 1027, 1028, 1030, 1031, 1032, 1033, 1035, 1114, 1119, 1137, 1138, 1139,* 1140, 1418 — see also nutrition below
  fertilizer placement, 412, 1119, 1137, 1350
  foliar diagnosis, 295, 411
  germination, 69, 403, 404, 745, 747, 748, 1011, 1126, 1127
  green manures, effect of, 300, 412, 1032
  growth and oxygen supply, 1382
  growth and soil impedance, 1382
  harvester, mechanical, 73
  harvesting, 413, 736
  harvesting date, 397, 741, 742, 751
  hedge windbreak, effect of, 1355
  herbicides, effect of, 1373
    ammonium dinitrophenate, 399
    CIPC, 942
    CMU, 233
    IPC, 942
    MCPA, 648, 1056
    TCA, 71, 752
    2,3,5-triiodobenzoic acid, 409*
    2,4-D, 399, 752, 1056
    2,4-DB, 1056
  in Africa, 63
  in Egypt, 386
  in Mexico, 387*
  in Morocco, 734, 1139*
  in Netherlands, 1123
  in Queensland, 736, 737
  in Rhodesia, 385, 1031
  in Romania, 1113
  in South Africa, 57, 301
  in USA, 385, 1123
  in USSR, 61, 62,* 388, 389, 390, 391,* 392,* 393,* 398, 738,* 739
  insecticides, effect of
    BHC, 747
    Lindane, 747
  interplanted, 538, 547, 1115, 1120, 1419
  irrigation, 295, 386, 582, 648, 734, 737, 1031, 1135, 1139*
  leaf, diseases of, 402
  leaf-area, -length, -width and dry weight, 804
  microclimate, 755,* 1344
  moisture content, 462, 649, 1014, 1142
  mulched, 300, 938, 1030, 1032, 1119

nitrate absorption in water culture, 410*
nutrition, 295, 410,* 634, 758,* 975, 977, 1034, 1137 — see also fertilizers above
nutritive value, 1005
oil content, factors affecting, 740
papyrus matting, grown through, 1030
pests
  billbugs
    Calendra callosa, 1131
    C. maidis, 1131
  earworm
    Heliothis armigera, 416
    H. obsoleta, 754
  European corn borer (*Pyrausta nubilalis*), 753
  rice weevils (*Sitophilus oryzae*),761
  stem borer, 1130
plant height and yield, 401
plant population, 58, 59, 73, 385, 394, 396, 397, 411, 412, 734, 1027, 1030, 1114, 1123, 1125
popcorn in USA, 385
protein content, 740
rainfall, effect of, Kenya, 1027
roots, ion absorption, 1133*
root growth, 1134*
rotations, 299, 385, 412, 928, 1027, 1032, 1119, 1121, 1341, 1342
seed
  endosperm, 407
  frost damage, 745
  fungicides, tetramethyl thiuram disulphide, 745
  moisture content, 462, 1142
  niacin content, 749
  overwintered in ground, 405
  pathogen damage, 745
  protein content, 740
  temperature, 745
seed certification, USA, 385
seed production, 739
seed rate, 397, 734, 740, 1030
seed treatment, 69, 70, 400, 404, 745, 747, 1011, 1030, 1124, 1125, 1127, 1132
seedlings
  green and albino, physiology of, 408
  pigment destruction, 756
silage, 397
soil hardness and growth, 1122
soil moisture, 1027, 1117, 1134, 1135
soil N and yield, 1121
sowing date, 397, 412, 737, 741, 742, 746, 751, 759, 1030, 1035, 1124, 1125
sowing depth, 1124
spacing, 73, 300, 385, 394, 396 397, 411, 751, 759, 1023, 1030, 1034, 1035, 1115, 1116, 1124, 1125
square-pocket sowing, 739
storage, 102, 104, 414, 761, 1011, 1028
sulphur dioxide, effect of, 274
sweet-corn
  in USA, 385
  pests
    corn earworm (*Heliothis armigera*), 762*
    fall armyworm (*Laphygma frugiperda*), 762*
  toxic effect on crops following, 415
temperatures, 745, 746
terramycin, effect of, 966
thinning, 394
topping, 299
varieties, 57, 64, 385, 735, 736, 744
  Amarelo Laranja....1129
  Branco Redondo....1129
  Caldera 401....397
  Caldera 402....397
  Caldera 821....397
  C.B.30....1417
  C.B.32....397
  Čiminskaja 1....398
  C.I.V.....1417
  C.I.V.2....397
  C.I.V.6....397
  Double Hybrid 52 DH 59....412
  Early Bagnolo....743
  Early Pearl....1033
  Eldridge Hybrid....298
  Goudster....397, 1123
  Gruševskaja....390
  Harjkovskaja 23....398
  Hickory King....72, 298, 299, 412, 1031
  J.S.Y.....651
  K. × P.P.....1418
  Kahila....1034
  Kalahari....1033
  KC 3....397
  Kenya White....1030
  KF 5....397
  Krasnodarskiĭ 1/49....398
  Kubanec....398
  Liming....389
  Liming Kubanskiĭ....398
  Mayorbella....651
  Minnesota 13....398
  Minnesota 23 Harjkovskaja....1125
  No. 51 DH 40....1031
  No. 52 DH 6....1031
  No. 50 H 35....72, 299, 1032
  No. 50 H 39....299
  No. 51 H 6....299
  No. 51 H 37....299, 1032
  No. 51 H 39....1032
  Odesskaja 10....66
  Ohio M 34....741
  Orla 266....741, 1023
  Partizanka....389, 398
  Pioneer 396....397
  Potchefstroom Pearl.... 299,1418
  Rhodesian Hybrid....1033
  Rjadova....1124
  Rjadovaja....404
  Rocamex H.220....68
  Rocamex H.230....68
  Rocamex H.309....68
  S.A.200....1418
  Salisbury White....1031
  Skorospelka No. 1....739
  Slavgorodskaja 270....390, 398
  South Cross..1031
  South Special....298
  S.R. Double Hybrid....298
  S.R. Hybrid No.1....299
  Sterling....398, 405
  Topbrid....1418
  Top Cross Potchefstroom Pearl 1033
  Tsolo....1419
  U.S.13....59
  VIR....67*
  Voronežskaja 76....398
  W.240....397, 1123
  W.255....58, 295, 741, 1023, 1123
  W.270....741
  White Horsetooth....745
  Yangambi....400
vernalization, 1124, 1125
weather and yield, Texas, 60
weeds in, 73, 300, 399, 653, 675, 750, 751, 752, 951, 1033, 1035, 1056, 1370, 1418
  Eleusine indica, 1128
  grass, 1368, 1371
  witchweed, 298
winterhardiness, 404
Z. mays indentata, 386
Z. mays indurata, 386
Z. mays rostrata, 65
Malachra, 907
Malathion — see Insecticides
Malaya, Federation of, Dep. Agric. Rep. 1954, 1421
Maleic hydrazide — see Growth substances
Malic acid, 561, 612
Manganese, photosynthesis, 259
Mangels (*Beta vulgaris*)
  Conserbeta, effect of, 1417
  in Norway, 494
  sprout inhibition, 144, 1417
  storage, 144
  varieties
    Barres Ferritslev....494
    Barres Øtofte Novax....647
    Barres Strynø....494
    Orange Globe....144
    Red Øtofte X....140
    Yellow Globe....140, 647
Manihot utilissima — see Cassava
Maps
  Africa South of Sahara, 568, 569
  East Africa, 1026
  Europe, 586
  Kenya, 1026
  Queensland, 219, 573
  world, 665
Marsh spot, 479, 1226
Matricaria chamomilla, 233
M. inodora and 2,4-D, 599
Mauritius, groundnuts, 1216
MCA — see Desiccants
MCP — see Herbicides
MCPA — see Herbicides and Growth substances
MCPB — see Herbicides
Melampyrum pratense, 985
Melinis minutiflora, chemical composition and fertilizers, 635
MENA, METER } see Growth substances
Mercury bichloride — see Fungicides
Mercury vapour — see Fungicides
Mesta — see Kenaf
Metasystox — see Insecticides
Methoxone — see Herbicides
Methyl bromide — see Fumigants
Mexico
  Dioscorea spp., identification key, 524
  maize, 387
  sorghum, 417
Millet
  as green manure, 771
  bibliography, 1161

Echinochloa frumentacea, caryopsis development, 419*
Eleusine coracana, 298
floral structure, 420
fertilizers, 1029
in India, 1161
rainfall, effect of, 1029
ridge cultivation, 649
rotations, 1029, 1345
fertilizers, 191, 1031
in India, 1161
in Rhodesia and Nyasaland, 1031
nutrition, 634
Panicum sp., root/shoot ratio, 1007
P. miliaceum
herbicides, effect of
CIPC, 942
IPC, 942
seed morphology, 74*
seedling root growth and nutrients, 620
P. miliare
rotations, 497
seed morphology, 74
weeds in, 653
Pennisetum sp.
as green manure, 930
in Africa (French), 766, 825
in Guinea (Portuguese), 927
rotations, 927
seed grading, 1148
var. Souna....930
witchweed in, 764
P. typhoideum, 764
chemical composition, 1005
fertilizers, 649, 1160, 1161
nutritive value, 1005
rainfall, effect of, 1160
rotations, 1146
seed grading, 1148
seed rate, 1147
spacing, 1147
varieties
AF3....1147
Masangu....1034
No. 28-15-1....1160
pests, 1161
Setaria italica
calcium/boron relationships, 1159
flowering and humidity, 75
in India (Bombay), 1161
sowing date, 1031
spacing, 1031
Milo — see Sorghum
Mimosa pudica, 651
Mites, 1206
Monosodium cyanamide — see Defoliants
Mormidea poecila — see Padi bug
Morocco
agriculture, 209*
maize, 734, 1139*
Serv. Rech. Agron. Exp. Agric., 291*
wheat, 18
Mozambique
cotton, 1432
wheat, 1432
Mulches
gravel, 300
groundnut-hay, 938
groundnut-shell, 938
straw, 300
stubble, 1032
Mulga (*Acacia aneura*), 1392
Mung bean
Phaseolus aureus, *Ph. mungo*, *Ph. radiatus* } see Beans
Mustard
as catch crop, 47
Brassica arvensis, 1070
in cereals, 648
Sinapis alba
herbicides, effect of 2,4-D, 599
salt tolerance, 921
wild, 1070
Myriophyllum elatinoides, 239
M. propinquum — see Water milfoil
Myzus persicae — see Aphids
N-1-naphthyl phthalamic acid — see Herbicides
NAA — see Growth substances
Nabam — see Fungicides
Nagli (*Eleusine coracana*) — see Millet
Najas spp., 1364
Naphthalene derivatives—see Growth substances
Napier grass, 1031
N.C.7 — see Insecticides
Nematodes — see Eelworm
Netherlands
air pollution, 274
cereal research 1955, 294
European Brewery Convention Rep. 1954, 1101
peas for canning, 121*
potatoes, 504, 1038
Nettles (*Urtica dioica*), 602
New Zealand
gorse-land reclamation, 675
Weed Control Conf. 1955, 675
Nicotine — see Insecticides
Niger seed (*Guizotia abyssinica*), 297
Nigeria
agricultural census, 218
agricultural development, 658
agriculture in, 1037*
cotton, 527
farming systems, 576,* 926*
Internat. Bank Reconstr. Devel. Rep. 1955, 658
Nitrogen economy plants, 1392,
Nitrogen constant 318, 627, 628
Nitrogen/yield relationship, 707*
N,N-diallyl-alpha-chloroacetamide — see Herbicides
Nodulation, 119, 132, 467, 485, 1225, 1384
Nomenclature, herbage plants, 319
Norway
agriculture, 1423,* 1424
fodder-beet, 494
mangels, 494
wheat, 335
NPA — see Herbicides
Nutgrass (*Cyperus rotundus*), 1364
Nyasaland, cotton, 546
Oats (*Avena* spp.) — see also Cereals
after sorghum, 1144
after soyabeans, 1144
as cover crop, 936
A. fatua, 235, 943, 1358, 1370
A. ludoviciana, 235
climate and yield, 94
clipping, 36,* 718, 1088
defloration, 1092
defoliation, 1088, 1092
diseases
blight (*Helminthosporium avenae*), 458
grey speck, 1226
rust (*Puccinia graminis tritici*), 98
fertilizers, 646, 1088, 1095, 1349 — see also nutrients below
food reserves, translocation, 1092
germination, 41, 456, 458, 797
growth substances, effect of, 370
IAA, 1402
2,4-D, 1402
harvesting date, 713, 797
hedge windbreak, effect of, 1355
herbicides, effect of
Agroxone, 97
CIPC, 942
IPC, 942
MCPA, 372
sodium chlorate, 602
2,4-D, 599, 1402
Weedone, 97
in Belgium, 1090
in Queensland, 1337
in Spain, 455
irrigation (spray), 1349
lodging, 45
microclimate, 1388
mixtures, 34, 35, 225, 226, 713
moisture determination, 1014
mycorrhiza development, 459
nutrition, 29, 619, 634, 975, 980, 1095, 1096, 1097, 1226 — see also fertilizers above
photoperiodism, 43, 371,* 717
protein, 1196*
rabbit damage, 1198
respiration, 797, 1195
root(s)
exudates, 369,* 1378*
fluorescent compounds in, 369
growth substances, 370
mycorrhiza development, 459
rotations, 497, 656
salt tolerance, 921
seed
gamma irradiation, effect of, 716*
polysaccharide content, 42*
respiration losses and harvest date, 797
ripening changes in, 797
varietal characters and identification, 715
seed rate, 458, 713, 718, 1190
seed setting, 1094*
seed shedding, 797
seed treatment, 458, 647, 716*
soil-water use, 1027
sowing date, 454, 712, 1190
spacing, 649, 718, 796
starch estimation, 461
stem (main), yield from, 1092
temperature, 43, 44, 712
terramycin, of, effect 966
tillers, yield from, 1092
transpiration, 44
varietal characteristics, 368, 715
varietal classification, 1090
varietal identification, 715, 1090
varieties, 714, 800
Ajax....649
Alamo...367
Albyn Donside...38
Andrew....367, 1025
Ardee (Potato)....454, 1192
Avon (W. 29)....39
Ayr Commando....1089
Ayr Line....38

Ayr Line Potato....1089
Ballidu....39
Ballyhaise....1192
Bambu....97, 797
Bambu II....797
Bell....38
Blenda....38, 366, 715, 1022, 1023, 1089, 1192
Bond....43, 717
Bonstar....293
Boone....649, 799, 1028
Cimarron....367
Clintland....43, 717
Curlew....656
Eagle....34, 366, 715
Firlbeck Gelbhafer I....1023
Flämingstreue....1023
Floriland....367, 652
Forkedeer....367
Forward....38, 1089
Frazier....367
Fulghum....39
Fultex....367
Garry....1035
Glasnevin Triumph....293, 454, 1022, 1192
Golden Rain II....715
Gopher....455
Grey Algerian....649
Grey Winter....37
Gullregn II....797
Hybrid No. 7....644
Jongesklip....300
Kanota....1025
Lampton....649, 1028
Langgewens....300
Lightning....715
Marne....38, 1023
Mass Selection D....1192
Milford....646
Mo 0–205....43, 717, 1025
Mulga....1028
Mustang....367
New Nortex....367
No. 3003F....1028
No. 0355 × Gopher....455
Orient....39
Orion I....40, 280
Orion II....40, 280
Orion C....40, 280
Örn (Eagle)....34, 366, 715
Overland....1190
Palu....646
Picton....37
Potato (Ardee)....454, 1192
Primus....368
R.L. 1734....799
S84....454, 1022, 1192
S147....37, 644, 1088
S172....37
Same....40, 280
Scotch Potato....454, 1192
Seger I....366, 368
Seger II....366
Seminole....367, 652
Simcoe....43, 717
Sisu....1023
Sol II....97, 366, 368
Southland....367
Star....715
Steel(Sun II)....38, 454, 646, 647, 715, 1022, 1192, 1193, 1195
Stormont Grandee....38
Stormont Iris....454
Stormont Kern....38
Sun II....38, 454, 646, 647, 715, 1022, 1192, 1193, 1195
Sunland....367, 652
Sv. Stjrän....368
Sv. 33/2067....366
Tama....649
Tennex....367
Triumph....647, 1022, 1193
Utility....38
Vickland....1028
Vicland....649, 1028, 1035
Victorgrain....43, 717
Victorgrain 48/93....367
Victory....715
Victory II....366
Vidar....280
Vikota....1028
W.29 (Avon)....39
W.32....39
Wintok....367
Yielder....372
wireworm, 647
weeds in
Centaurea picris, 1372
Cirsium arvense, 1372
Convolvulus arvensis, 1372
wild, 235, 644, 942, 943, 1228, 1358, 1370, 1371, 1417
winterhardiness, 1093
Oil plants (minor)
Crambe abyssinica, 205
Euphorbia lathyrus, 1335
Hyptis spicigera, 297
Lupinus termis, 131
Niger seed, 297
Onion twitch, 1422
Onion weed (*Asphodelus fistulosus*), 595, 1422
Ophiobolus graminis — see Take-all
Oro, 108
Ortho Seed Guard —see Fungicides
Orthocide 75 — see Fungicides
Oryza spp. — see Rice
Oscinis frit — see Frit fly
Ovotran—see Insecticides
Oxalis tuberosa varieties in Peru, 525
Amajaya....525
Ckeni....525
Lluchuoca....525
Ruqui....525
Pachymoerus cassiae — see Weevil
Padi bug (*Mormidea poecila*), 1420
Pale western cutworm (*Agrotis orthogonia*), 1075
Panicum spp., 80
P. maximum — see Guinea grass
P. miliaceum, *P. miliare* } see Millet
Panogen — see Fungicides
Papaver rhoeas — see Poppy
Parathion — see Insecticides
Parkia filicoidea, 1005
Paspalum dilatatum, 240
P. distichum, 240
P. scrobiculatum varieties, 1154
PCP — see Desiccants and Herbicides
Peas (*Pisum* spp.) —see also Legumes
amino acids in, 480
blue, 1224
canning, 121*
desiccants, MCA, 1228
diseases
Ascochyta pisi, 123, 478
marsh spot, 479, 1226
mosaic virus, 1230
fertilizers, 476, 644, 835—see also nutrients below
fertilizer placement, 932
for drying, 1224
fumigants, methyl bromide, 1227
fungicides, Spergon, 1225
germination, 1225
growth substances, effect of
gibberellic acid, 125
IAA, 125
harvesting, 476
herbicides, effect of
CIPC, 942
Dinoseb, 1228
DNOC, 247
DNOIPP, 1228
4-chlorophenoxyacetic acid, 830
IPC, 942
MCPA, 830
2,4-D, 830
2,4,5-T, 830
3,4-D, 830
TCA, 71
in Gt Britain, 827*
in Sweden, 476
manganese oxidation in, 1417
marrowfat, 1224
mixtures, 35, 225*, 713
nitrogen
compounds in, 834
metabolism in, 480
nodulation, 485, 1225
nutrition, 295, 624, 975, 980, 1226, 1417 — see also fertilizers above
pests
beetles
Callosobruchus chinensis, 126
Acanthoscelides obtectus, 126
pods
amino acids in, 480
empty, 124
N metabolism in, 480
roots, enzymes in, 832
root exudates, 1378*
rotations, 476, 678, 1342
salt tolerance, 921
seed
amino acids in, 480
flower-promoting substance from, 833
N compounds in, 834
N metabolism in, 480
physiology, 124
seed inoculation, 1228
seed rate, 1224
seed setting, 122
seed treatment, 476, 828, 954, 1225, 1227
seedlings, respiration, 831*
soil and moisture needs, 476
sowing date, 476, 1228
sowing depth, 476
storage, 123, 126, 1227
varieties, 476
A–100....478
Advancer....478
Alaska....478, 830
Bottina A....280
Bottina B....280
Canner's Perfection....124, 834
Clipper....664
Concordia....477
Duke of Albany....125

Emigrant....664, 1224
H–539....830
Harrison's Glory....1224
Improved Pilot....125
Kelvedon Wonder....664
Kloster....477
Mansholt's Pluk....649
Meteor....125, 664
Nola I....280
Onward....664
Parvus....122
Perfection....830
Rondo....664, 1224
Servo....649, 664, 1224, 1228
Strål....477
Super Alaska....478
Thos. Laxton....478
Torsdags II,....835
Torsdags III.....477
U.05801....122
Unica....649, 1224
Vesta....280
Zelka....1224
vining, 644
weeds in, 476, 829
thistle, 1056
wild oats, 1228
Pea mosaic virus, 1230
Pea root eelworm (*Heterodera göttingiana*) — see Eelworm
Pectinophora gossypiella—see Bollworm
Pennisetum clandestinum, 1035
P. typhoideum — see Millet
Pentachlornitrobenzene — see Fungicides
Perecot — see Fungicides
Perennial sowthistles (*Sonchus* spp.) — see Sowthistles
Perenox — see Fungicides
Perilla ocymoides, 974*
Peru
Oxalis tuberosa, 525
wheat, 341
Pestox 3 — see Insecticides
Petroleum naphthas — see Herbicides
Phenoxylene 30 — see Herbicides
Philippines
cotton, 1307
kenaf, 1327
Phosphine — see Fumigants
Photometer, 996*
Photoperiodism, 258 — see also individual crops and Plants
Phragmites communis, 240
Phygon — see Fungicides
Physalis angulata, 82
Phytophthora infestans — see Blight
Pigeon pea (*Cajanus indicus*)
as green manure, 794
chemical composition and fertilizers, 635
intercropped, 547
Pigweed, 1370
Pink bollworm (*Pectinophora gossypiella*) — see Bollworm
Piricularia oryzae — see Wilt
Piroxvariante — see Insecticides
Pisum spp. — see Peas
Plant(s)
analysis, 616*
amino-acid separation, 1397*
azetidine in, 261
copper determination, 267*
extracts, preparation of, using EDTA, 611
iron determination, 268*
lignin determination, 266*
malic acid determination, 612
molybdenum determination, 267*
phosphate determination, 269
potassium determination, 1399*
sodium determination, 1399*
spectrochemical, 617*
spectrographical, 1398
starch determination, 1396
sucrose synthesis, 1394
titanium determination, 267*
yield diagnosis, 615*
anatomy, 659
carbon dioxide-exchange measurement apparatus, 787*
ecology, 1426
environment
adaptation, 260
air pollution, 274, 998
climate, Finland, 1387*
drought resistance, 973
frost resistance, 972
hydrofluoric acid gas, 998
microclimate, air temperature, 755*
saline conditions, 310
sulphur dioxide, 998
water, 973
weather, 1385
winter injury, 1197
evapotranspiration measurement,610
foliar spraying, 5
growth
and light wavelength, 1393
and potassium, 1293
-chambers, 997
under controlled light and temperature, apparatus for, 993*
leaf
-area index, 359
cell protein, 971
disintegrator, 995
morphology, 968
radiocarbon dioxide for, 254
light intensity measurement, 609
morphology, 999*
nitrogen constant 318, 627, 628
nitrogen economy, 1392
nomenclature, 1428*
nutrition, 259, 262, 264, 267, 317, 357, 621, 622,* 623,* 636, 976,* 979, 983,* 984,* 985, 986,* 987,* 988,* 989, 990,* 991,* 992,* 994, 1157, 1413
osmotic pressure and soil water, 1391
photoperiodism, 258*
physiology, 608, 659, 660
potted, experimental technique, 1400*
reproduction, pollen grain growth, 255
respiration studies, 700
root
cation adsorption, 965*
excretions, 614, 1378,* 1379,* 1380
growth-pressure measurement, 252
rhizosphere, effect on bacteria, 1381
sampling, 961
severed by ground cavities, 604
systems, 272,* 961, 963, 1383
-tip (soil-free) production, apparatus for, 964
transpiration, 605,* 606, 1386
turgor, determination, 607
water use, 1386
yield/nitrogen law, 627, 628
Plant exploration, Australia, 1432
Plant introduction, Australia, 1432
Plant population — see individual crops
Planting date — see individual crops
Plasmodiophora brassicae — see Club-root
Plusia nu, 551
Poa annua — see Annual blue grass
P. pratensis — see Kentucky bluegrass
Pod weevil (*Ceuthorrhynchus assimilis*) — see Weevils
Poisonous plants
Adenia digitata, 1403
castor oil plant, 1403
Cucumis spp., 1403
Datura stramonium, 1403
hemp, 1403
Senecio spp., 1403
Pollen grain, growth on stigma, 255
Polygonum spp., 233
P. aviculare, 644, 1091
P. latifolium, 694
P. persicaria, 646, 1091, 1302, 1417
Polyoxyanthraquinone — see Growth substances
Polyspora lini, 549
Poppy (*Papaver* spp.)
and hedge windbreak, 1355
P. rhoeas, 1266
Portugal
agricultural survey, 1414
rice, weeds in, 81
Potamogeton sp., 80, 239, 1364
P. crispus, 297
Potassium
determination, plants, 1399*
symposium, 1051
Potassium cyanide, 1080
Potassium indole acetate — see Growth substances
Potatoes (*Solanum tuberosum*), 147
after ploughing, shallow v. deep. 1024
bitterness, 1287
bolters, 1285
carbohydrates in, 1288
chemical composition and fertilizers, 295
chipping quality, 1264
chloride and sulphate treatment, 1290*
defoliation, 1271
degeneration, 510
diseases
Alternaria solani, 1034
blight (*Phytophthora infestans*), 154, 155, 156,* 499, 505, 506, 872, 1023, 1271, 1273
hair sprout (*Colletotrichum atramentarium*), 1277
internal brown spot, 157
leaf roll, 1023, 1417
mosaic, 1023
potato wart (*Synchytrium endobioticum*), 507*
rot, 875, 1290*
Erwinia atroseptica, 517
E. carotovora, 871
rugose mosaic, 1417
silver scurf (*Spondylocladium atrovirens*), 508

stem-streak necrosis, 1278
verticillium wilt, 501*
virus X , 1276
dry-matter determination, 515
fertilizers, 163, 164,* 278, 295, 499, 516, 618, 872, 882, 883, 890, 1008, 1021, 1023, 1024, 1278, 1291, 1292, 1293, 1349, 1422 — see also nutrition below
fertilizer placement, 932, 1417
flavour and growth substances, 1295
flavour and insecticides, 169
flavour and solanine, 1287
Florida test, 874
fodder, conservation for, 520
for starch, 1267
freeze-drying, 167
fungicides, effect of
Agrimycin 100, 875
mercury bichloride, 508
growth substances, effect of
gibberellic acid, 625
IPC, 1295
maleic hydrazide, 1294, 1295
MENA, 1295
METER, 1295
PU, 1295
TCNB, 1295
harvesting, 165
harvesting damage, 150, 884
harvesting date, 292
haulm destruction, 148, 154, 1374
heat tolerance, 162
hedge windbreak, effect of, 1355
herbicides, effect of, 1373
MCPA, 153
sodium chlorate, 602
2,4-D, 153, 1294
in Japan, 145
in Rhodesia and Nyasaland, 1031
insecticides, effect of Lindane, 169
irrigation, 498, 1417
spray, 1349, 1422
water, 1263
microclimate, 1388
moisture-content determination, 879
mulched, 938
nutrition, 880, 881, 979, 985, 1289* — see also fertilizers above
origin of, 1281
pests
eelworm, 1274
Heterodera rostochiensis, 509
leaf aphids, 1023
wireworms, 292, 1275
Limonius canus, 873
photoperiodism, 1284, 1285, 1286
planting date, 300, 499, 509, 865, 866, 873, 1264, 1277
pollen storage, 1279*
pollination, 877
pre-planting temperatures, 502
protein content and soil type, 514
protein determination, 878
respiration, 513, 880
ridge cultivation, 1262
rotations, 300, 497, 508, 866, 1274, 1342
seed potatoes
chitting, 865
dormancy breaking — see also sprout induction below
Arenz method, 1023
Rindite method, 874, 1023
frost damage, 1023
in Germany, Netherlands and USSR, cultivation methods compared, 504
planting date, 504, 509, 873, 1023
seed rate, 146
seed testing, 874
seed treatment, 1275
setts
cut, 170
square-planted, 867
treatment, 517, 871, 875
size, 146
spacing, 146, 867
sprout induction, 503, 865, 870, 1269
storage, 876,* 1270, 1296
storage temperature and germination, 1296
seed (true)
failure, 1280
sowing date, 1272
soil acidity, 868
soils, effect of, in Hungary, 514
soil moisture, 149, 1290*
soil-type and vitamin C, 514
solanine in, 516, 1287
spacing, 653, 1034, 1035, 1262
specific gravity and defoliation, 1271
sprouts
anatomy and morphology, 511
ascorbic-acid content, 1160
from normal and degenerated tubers, compared, 512
inhibition, 168, 518, 885, 1039, 1295
number and tuber formation, 152
square-pocket planting, 1262
starch yield, 499
storage, 165, 166, 168, 169, 508, 517, 518, 519, 651, 885, 1039, 1294, 1295, 1297, 1298
sulphur-dioxide damage, 274
tissue cultures, 159
tubers
colour and 2,4-D, 1294
formation, 152, 158, 1283
and day length, 1286
solanin content, 516, 1287
weight and soil moisture, 149
varieties, 1038, 1265
A.49....1028
Ackersegen....170, 320, 499, 1023, 1034, 1266, 1284
Agnes....170
Alpha....651
Anemone....1266
Antigo....1268*
Aquila....1034, 1266
Arran Banner....151, 292, 500
Arran Consul....651
Augusta....320, 499
Awaba....656
Benedikta....320
Benumaru....870
Bevelander....1034
Bintje....1023, 1284
Bismark....1422
Blauwe Eigenheimer....1034
Bliss Triumph....169
Brownells....1422
Canoga....161
Canso....1278
Capella....499, 1266, 1267
Carmen....1267
Cherokee....169, 1278
Chippewa....1280
Chitose....870
Craig's Alliance,....151
Craig's Royal....151
Crana....656
Cresus....869
Dalila....869
Duke of York....1422
Dutch Robjyn....1028
Eigenheimer....869
Epicure....509
Erato....869
Erdgold....320
Erstling....867, 1284, 1285
Eschyle....869
Etoile du Léon....157
Flava....1276
Frühmölle....1266
Frühnudel....1266
Furore....1032, 1034
Gineke....1032
Great Scot....1031
Green Mountain....651, 1278
Gul Øtofte X....292
Herkula....1267
Hilla....1266
Hokkai No. 1 and 2....870
Home Guard....157
Hunsballe X....292
Industrie....1034
Irish Cobbler....158, 169, 517, 870, 1264, 1278
Jakobi....1284
Johanna....1266
Katahdin....152, 502, 512, 656
Kennebec....299, 870, 1032, 1264
Kerr's Pink....147
King Edward VII....872
Local Nyangusu....1028
McIntyre....1278
Majestic....157, 1417
Maritta....320, 1267
Menominee....870
Merkur....1266
Mira....1266
Mohawk....517
Monac....299
Netted Gem....1287
No. 529–1....870
Norin No. 1....870
Nova....1266
Øberarnbacher Frühe....157, 170
Pajbjerg Rex X....292
Pawnee and 2....870
Pentland Ace....299
Pink Eye....1422
Pontiac....169, 656
Red Beauty....501*
Red McClure....1294
Red Otofte X....292
Red River Valley....521*
Red Skin....147
Retriever....300
Rosa....869
Russet Burbank....161, 1288
Sabina....320
Sanita....1266
Saskia....1284
Sebago....169, 517, 651, 875, 1035, 1278
Sequoia....1422
Sharpe's Express....157
Shimakei No. 30....870

Sieglinde....1266, 1284
Sientje....1034
Star....1266
Stormont Dawn....292, 500
Teton....517
Triumph....168, 867, 870
Ulster Emblem....151, 500
Ulster Ensign....151, 500
Ulster Prince....292, 500
Ulster Supreme....292, 500
Up-to-Date....651, 1031, 1036
Vera....170, 1266
Voran....320, 1023
Wekaragis....157
washing methods, 1348
weeds, in 153
Potato beetle, 1023
Potato root eelworm (*Heterodera rostochiensis*) — see Eelworm
Potato wart (*Synchytrium endobioticum*), 507*
Powdery mildew, 1417
Pseudomonas sesami — see Leaf spot
Pteridium aquilinum, 602
PU — see Growth substances
Puccinia spp. — see Rust
Pueraria spp. — see Kudzu
Puerto Rico, cotton, 1308
Purslane, 1370
Pyrausta nubilalis — see European corn borer
Pyrethrum/piperonyl butoxide, 761, 1028
Pythium spp., 746, 1126
Queleas, 672
Quickgrass (*Cynodon* sp.), 236
Quinoa (*Chenopodium quinoa*), 208
R1489 — see Fungicides
Rabbit damage, 1198
Ragwort, 675
Rala (*Setaria italica*) — see Millet
Rape (*Brassica* spp.)
B. campestris var. *oleifera*, 1329
cold hardening, 1331
in Gt Britain, 917
salt tolerance, 921
B. napus, 458
fertilizers, 1390
in Gt Britain, 1329
nitrate content, 270
nutrition, 565, 985, 1334*
photoperiodism, 1334*
pod weevil (*Ceuthorrhynchus assimilis*), 564
propagation methods, 918
swede, crossed with, 1002*
transpiration, 1390
B. napus var. *oleifera*
cold hardening, 1331, 1332, 1333
fertilizers, 916, 1329
in France, 916,* 1330
in Gt Britain, 917, 1329
oil content, 919
seed production, 1024, 1329
seed rate, 1329
spacing, 1329
varieties
Alsace....563
Dippe....563
Essex Dwarf....1329
Hamburg, 563, 918
Hochzucht....1024
Lembke....563
Margo....1024
Matador, 1333
Platzfester....1024
Platzwiderstandfähiger,....1024
Regal....1024
Scherwitz St. 1236....1024
Tenus....1024
wilting method, 1390
Raphatox — see Herbicides
Rd. 4236 — see Herbicides
Red rice, 1172
Red sickness, rice, 1421
Reddening disease, cotton, 1315
Redshank (*Polygonum persicaria*), 646, 1091, 1302, 1417
Reports — see individual countries
Réunion, soil erosion, 589
Review articles
Field beans in Gt Britain, p. 65
Fodder production from winter-sown cereals and its effects upon grain yield, pp. 129 and 207
Weed control in cereal crops in Europe by chemicals, p. 1.
Rhizoctonia sp. — see Wilt
Rhodesia, weeds, 1427
Rhodesia (South)
Agric. Exp. Sta. Rep. 1953–4, 1954–5, 299, 1032
ecological survey (Sabi Valley), 924
fodder-beet, 139
Gwebi Coll. Agric., field experiments 1950/51–1953/54, 412
irrigation (Sabi Valley), 924
maize harvesting, 413
seed testing, 1013
soils, nutrient status, 1008
Rhodesia and Nyasaland, Federation
crops in, 1031
Minist. Agric. Rep. 1954, 1031
soil erosion, 1031
Rhyssomatus near *subcostatus* — see Weevils
Rice (*Oryza* spp.), 650—see also Cereals
akiochi conditions, 782, 1183
Aman varieties, 1178
bunds, grassed, 82
calcium, effect of, 89
chemical composition, 100, 295, 635, 1005, 1184
chlorosis, 90
choline content, 100
dibbling, sprouted seed, 1166
diseases, 1174
brown linear spot (*Cercospora oryzae*), 1175
red sickness, 1421
root rot, 775
sheath rot (*Sclerotium sphaeroides*), 1175
stem rot (*Leptosphaeria salvinii*), 1175
straighthead, 438
wilt (*Piricularia oryzae*), 83,* 437
double cropping, 1167
drought resistance, 452
ear emergence, 1178
esculin oxidization, 1183
fertilizers, 92, 295, 296, 422, 448, 449, 452, 635, 650, 663,* 771, 792, 793, 1138, 1185, 1420, 1421 — see also nutrients below
fertilizer placement, 448, 452, 1421
floating, 1169
flowering, 86
green manures, effect of, 792, 794, 1421
growth studies, 782
irrigation water, effect of, 79
respiration, 787*
temperature, effect of, 790
gypsum, effect of, 1186
harvesting, 1187
height sampling, 1189*
herbicides, effect of
MCPA, 1056
2,4-D, 1056
2,4-DB, 1056
hydrogen sulphide, effect of, 775, 1181, 1182
hygroscopic equilibria, 451*
in Africa (French), 771, 773
in Belgian Congo, 433, 424
in Borneo (North), 216
in California, 422
in Costa Rica, 78*
in Egypt, 1163
in France, 767
in Guiana (Dutch), 82
in India, 435
in Japan, 77, 425, 1174
in Korea (South), 772*
in Spain, 421*
in USSR, 1164
irrigation, 422, 423,* 770
sprinkler, 582
leaf-area, -length, -width and dry weight, 804
light intensity, 783, 784
milling, 424, 450
non-irrigated, 771
nutrition, 447,* 452, 777, 778, 779, 780,* 781, 978, 1034, 1180, 1421 — see also fertilizers above
nutritive value, 1005
on peat land, 91
on saline soils, 1186
O. glaberrima
in Africa, 1176*
in Guiana (French), 1177*
varieties, 773, 1168
Boussa Diambou....1169
O. sativa f. *indica* × *O. sativa* f. *japonica*, 432
panicles, 438, 439*, 443
pests, 84,* 1188*
caterpillar, 1420
padi bug, 1420
photoperiodism, 87, 88, 440, 441, 442, 452, 789, 1179, 1421
photosynthesis, 783
plant population, 768
planting, 298
planting date, 770
pollen germination, 776
protein content, 1184
ratooning, 770
Redox potential, 788*
respiration, 778, 783, 787*
ridge cultivation, 769
root depth, 1034
root growth and H_2S, 85
rotations, 296, 422, 452, 771, 1164
seed dibbling, 1166
seed dormancy, 434
seed drying, 450
seed rate, 771
seed treatment, 452
seed viability, 434
seedling, density and light intensity, 784

seedling, uprooting resistance measurement, 446
shoot/root ratio, 1034
soil oxygen, effect of, 1180
sowing, 298, 1166
sowing date, 296, 440, 771, 781, 1163, 1165, 1170, 1178
spacing, 93, 768, 771
starch grains in plant tissues, 444
storage, 434, 795, 1188*
submersion, resistance of plants to, physiology of, 791
sun-cracking, 1419
temperature, 44, 86, 451, 783, 790
tiller sampling, 1189*
transpiration, 44
varietal classification, 429
varieties, 422, 430, 773, 1168, 1178
Abumonbary Vango....1034
Afaa Mwanza....93
Agami....1163
Ambarikore....1028
Angola Crystal....298
B. 76 (Putia-Shankar)....442
Backgora....789
Baljati....87
B.G.79....93
Blue Rose 41....1034
Bluebonnet....428, 1034
Bluebonnet 50....651
Bokapo....1034
Boussa Diambou....1169
Buffalo....651
Burma....298
Caloro....90
Caloro 2....1184
Century Patna 231....651
Ch. 4....789
Ch. 41....789
Ch. 47....789
Ch. 63....789
Colusa 1600....450
D.99....93
D.114....93
E.425....771
Faya....298
Fortuna....651
Gendjah Ratji 277....88
Giza 14....1163
Hansharaj....87
Heenati....88
Hungarian....789
Iguape....1034
Indo-China No. 53....296
Jirasal....431
Kahogo....1030
Kapela....1034
Kolaba....789
Kothandan 517....1167
Lead....93
Magnolia....427
Makalioka....1034
Mangala....1034
Mbagboli....296
M.L.E.....433
Nato....427
No. 2/8....93
No. 2/16....93
No. 278 Sathra....768
No. 349 Jhona....768
No. 370 Basmati....768
No. 415....771
No. 902....771
Norin 22....1183
Norin 37....445
Palthondi 9114....1167
Pebifun....434
Perola....1034
PTB 2....792
PTB 20....792
Putia-Shankar (B.76)....442
R. 52....771
R. 55....1034
R. 65....771
R. 66....433
R. 67....433
R. 69....1034
Raminad Strain 3....1175
Rathkayaral 3753....1028
RDR 2....1170
RDR 3....1170
RDR 4....1170
RDR 7....1170
Rexoro Purple Leaf....427
Reyong 6....774
Rz 111....433
Sarguja....789
Seri Raja....774
Sindano....1028
Stirpe 77....1034
Sukhvel....431
Sunbonnet....428
T.3....441
T.12....441
T.21....441
T.23....440
T.36....440
T.A.64....87
Texas Patna....651
T.N.32....87
Toro....428
U.S.3.....1163
U.V.S.....1030
Y.3....433
Yabani 7....1163
Yabani 47....1163
Yabani Pearl....1163
Yubae....1183
Zenith....427, 1034
ventilating system in, 445
water requirement, 655
weeds in, 81, 435, 436, 1056
Alisma plantago, 80
Alopecurus geniculatus, 80
Canna glauca, 82
Echinochloa colonum, 82
E. crus-pavonis, 82
Fimbristylis miliacea, 82
grass, 1173
Ischaemum rugosum, 82
Jussieua spp., 82
Leptochloa scabra, 82
Panicum spp., 80
Physalis angulata, 82
Potamogeton sp., 80
red rice, 1172
wild, 1171
wind damage, 426*
yield forecasting, 785, 786
yield sampling, 1189*
Rice weevils (*Sitophilus oryzae*) — see Weevils
Ricinus communis — see Castor oil plant
Rindite — see Growth substances
Röber-Petkus seed-cleaning machine, 1362
Romania
agricultural economy, 313
agriculture, 1113
maize, 1113
Roselle (*Hibiscus sabdariffa*), 907, 10
Agrilus acutus, 907
seed rate, 907
H. sabdariffa var. *altissima*, 907
spacing, 556
Rosette disease, 116*
Rots, 875, 1290*
Erwinia atroseptica, 517
E. carotovora, 871
Leptosphaeria salvini, 1175
Sclerotium sphaeroides, 1175
Rotations, 1340,* 1411 — see also individual crops
in Brazil, 1416
in Israel, 575
in Kansas, 1343
In USSR, 668
ley/arable, 302
on irrigated land, 1342
Ruanda-Urundi
farming systems, 228
meteorological records, 1018*
Rushes
Eleocharis acuta, 239
Juncus articulatus, 239
Rust (*Puccinia* spp.), 33
Puccinia graminis, 20, 98, 323, 64 1028
P. polysora, 400, 401, 1027
Rutabagas (*Brassica napus* var. *nap brassica*) — see Swedes
Ryania — see Insecticides
Rye (*Secale cereale*)—see also Cereals
after ploughing, 1024
as catch crop, 47
as cover crop, 415
diseases
ergot, 1098
snow mould (*Fusarium nivale*), 4
eelworm (*Heterodera major*), 1417
fertilizers, 698, 721, 1349—see also nutrition below
for spring grazing, Wales, 720
germinating energy, 456
growth and fertilizers, 698
growth and water deficiency, 731
harvesting, 1100
herbicides, DNOC, 247
irrigation, 698, 1349
microclimate, 1388
moisture determination, 1014
mycorrhiza development, 459
nucleic acid from leaves, 613
nutrition, 731—see also fertilizers above
photoperiodism, 1099
protein, 1196*
rabbit damage, 1198
root/shoot ratio, 1007
salt tolerance, 921
seed, excretions from, 801
seed cleaning, 1098
seed rate, 47
seed treatment, 1098
sowing date, 453, 719
varieties
Agro....1100
Bernaroggen....1023
Björn....280
Carstens....1023
Coker's 8–21....652
Dominant....1023
Fellerser × Petkuser....1023
Karlshulder....1023
Kungs II....1100
Pearl....48

Petkus....48, 1099, 1100
Petkuser....1023
Vjatka....460, 702
Zitkinskaja....460
vernalization, 460, 702, 1099
water deficiency and growth, 731
wild oats, 1417
yegrass (*Lolium* sp.) and CDAA, 1369
afflower (*Carthamus tinctorius*), 203
in Utah, 912
irrigation, 655
processing, 203
protein extraction and use, 207
seed production, 912
utilization, 203
varieties
N 5....912
N 6....912
N 8....912
N 10....912
N 852....912
alix spp. — see Willows
alt tolerance, crops, 921 — see also individual crops
alvinia auriculata, 948, 1363
amai (*Panicum miliare*) — see Millet
and rocket (*Diplotaxis tenuifolia*), 596
aponin, 533
awan (*Panicum miliare*) — see Millet
clerotium sphaeroides — see Rots
cotmec-Oxley moisture meter, 1014
crub, 675
ecale cereale — see Rye
edge, 1368
eed — see also individual crops
Compositae, 256*
germination, 257
oil-yield estimation, 206
source and performance, 484
weeds, 249, 284
eed-borne parasites, detection, 1010
eed certification standards, USA, 285
eed cleaning, Röber-Petkus machine, 1362
eed-corn maggots
Hylemya brassicae, 496
H. cilicrura, 814
H. floralis, 496
eed counter, photoelectric, 1012
eed-drill, for cereal plot experiments, 809
eed exchange, Belgium, 1048
eed potatoes — see Potatoes
eed production, 286 — see also individual crops
eed rate — see individual crops
eed sampling methods, 457
eed storage — see Storage
eed testing in S. Rhodesia, 1013
eed treatment, 1010, 1411, 1412* — see also individual crops
eedling vigour, 1376
eid grass (*Cyperus rotundus*) — see Nutgrass
enecio spp., 1246, 1403
enegal
groundnuts, 825
millet, 825
rice, 771
esame (*Sesamum indicum*), 1328
flowering character, 559
harvesting, 1328
leaf formation, abnormalities in, 558*
leaf spot (*Pseudomonas sesami*), 908
nutrition, 356, 565*
photoperiodism, 202
plant population, 200
rotations, 1146
seed treatment, 908
sowing date, 1328
spacing, 200, 1328
varieties
Acarigua....201
Criolla....200
Goghat....202
Inamar....201
Jinardi....202
Morada....201
Palmetto....908
Venezuela 51....200, 201
Venezuela 52....200, 201
Sesbania aculeata, 1421
Setaria spp., 1324
S. italica — see Millet
S. lutescens, 942
S. pallidifusca, 497
S. viridis, 942
S.E.X. — see Defoliants
Sheath rot (*Sclerotium sphaeroides*),— see Rots
Shed-a-leaf — see Defoliants
Shell No. 30, 1363
Shell *Salvinia* Weedkiller — see Herbicides
Shelterbelts, 227, 228, 933, 1354, 1355 —see also Windbreaks
Sierra Leone Dep. Agric. Rep. 1953, 296
Silica — see Insecticides
Silver scurf (*Spondylocladium atrovirens*), 508
Silvex — see Herbicides
Sinapis alba — see Mustard
S. arvensis — see Charlock
Sitophilus spp. — see Weevils
Skeleton weed (*Chondrilla juncea*), 656, 1360
Smog, 998
Smut, 347
Ustilago hordei, 726, 727
U. nuda, 54, 375, 725, 726
U. tritici, 695
Sorosporium reilianum, 70
Sphacelotheca sorghi, 297, 765
Tilletia brevifasciens, 1023
Snow mould (*Fusarium nivale*), 49
Sodium in plants, 1399*
Sodium arsenite — see Herbicides
Sodium azide, 1080
Sodium borate, Sodium chlorate, Sodium nitrate } see Herbicides
Sodium pentachlorophenolate—see Defoliants
Sodium sulphanilate — see Fungicides
Soft rot (*Erwinia atroseptica*) — see Rots
Soils
and crops, 929, 1006
cobalt content and crops, 1006
nutrients, 987, 989, 1008, 1096
salt, 310, 311, 921, 1186, 1336
waterlogged, 438
Soil compaction, 1346, 1382
Soil drainage, 586, 649, 1044
Soil erosion — see Soil and water conservation
Soil fertility, 314, 1029, 1432
Soil profile, preservation, 1383
Soil structure, 343
Soil surveys, Africa, 925
Soil temperature, 1344
Soil-water evaporation, 934, 1386
Soil-water use by crops, 1027, 1044
Soil and water conservation
African star grass, 1035
bush fallowing, Sudan, 1345
camber-bed cultivation, 579, 1028
catchment-area vegetation, S. Africa, 1353
chemical fallow, 1346
coastal sand-drift control, N.S.W., 591
contour ridging, 1030
field hollows, 1352
flooding, N.S.W., 592
in Australia,
N.S.W., 230, 231, 591, 592, 939, 941
Victoria, 574
in East Africa, 1353
in Europe, 586
in Réunion, 589
in USA,
Arkansas, 936
Texas, Blackland Exp. Sta., 935*
in USSR, 224
Kikuyu grass, 1035
legumes for, 132
mulches, 300, 938
sand stabilization, N.S.W., 591
shelterbelts, 227, 228, 1354
snow conservation, 224
soil drainage, 1044
soil erosion
and rotations, 588
in Europe, 586
in French West Africa, 587, 1356*
in Gt. Britain (Fens), 585
in New South Wales, 590
in Réunion, 589
in Rhodesia and Nyasaland, 1031
strip cropping, 940
tie-ridging, 191, 545, 1028
Solanum spp., tuber-bearing, 1281 — see also Potatoes
S. elaeagnifolium, in Madras, 597
S. tuberosum — see Potatoes
Sonchus spp.— see Sowthistles
Sorghum (*Sorghum* spp.), 764—see also Cereals
as green manure, 771
bibliography, 1161
calcium carbonate, effect of, 1158
chemical composition, 461, 635, 1005
drought tolerance, 1150
fertilizers, 635, 649, 650, 1005, 1008, 1029, 1146, 1418
herbicides, effect of
MCPA, 1056
2,4-D, 1025, 1056
2,4-DB, 1056
in Africa (French), 763, 766, 825
in Australia
New South Wales, 950
Queensland, 940, 1337
in Guinea (Portuguese), 927
in India, 1161
in Mexico, 417
in Rhodesia and Nyasaland, 1031
in USA, 385
Kansas, 1143
interplanted, 1419
irrigation, 655, 1031, 1143
mulching, 649, 1028

nutritive value, 1005, 1156
plant population, 1030
rainfall, effect of, 1146
ratoon crop, 1337
rotations, 1027, 1146
seed-bed, 1143
seed morphology, 1155
seed rate, 1143, 1145
seed treatment, 297, 765, 1143
smut (*Sphacelotheca sorghi*), 297, 765
soil-water use, 1027
S. caudatum, 763
S. durra, 763
Striga hermonthica in, 1364
S. elegans, 763
S. halepense, 945,* 1311
S. mellitum, 763
S. purpureo-sericeum, 764
sowing date, 1143
spacing, 1025, 1030, 1144, 1145
starch estimation, 461
storage, 102
tie-ridging, 1028
varieties, 766, 1143
Acme....417
Alpha....76
Atlas....417
Black Spanish....417
Caprock....417
Combine Hegari....1152
Double Dwarf Milo....1153
Duf Comb Milo....1153
Dwarf Broomcorn....417
Dwarf Milo....417
Dwarf White Milo....1364
Early Hegari....417, 1033
Early Kalo....76
Evergreen....417
Fulgar White....1149
Fulltip....417
Hegari....76, 1033, 1152
Hi Hegari....417
Honey....417
Italian....76
K205-2....1150
K 588....1150
Kafir I....417
Kafir 2C....417
Kalo....1035
Kanvi....1150
Kanvi Local....1149
Leoti....417
Maldandi 35-1....1145, 1149
Martin....1144
Midland....1025
Mpiwe....298
Nilwa....1146
No. 5140....1031
Plainsman....1025, 1144
Rancher....417
Redbine 1....417
Redbine 2....417
Redbine 3....417
Ribbon Cane 5151....1031
Saccaline....76
Scarborough....417
Shallumex 1....417
Sourless....417
Suk 1....1030
Sumac....417
Summer 6550....1153
Tracy....418
Wad Fahl....1364
Westland....1025
White Sooner Milo....1153
Y 2....1151
Y 417-5....1151
Yanigar....1149, 1151
water excess, 1157
weeds in, 750, 1025, 1056
witchweed, 764, 1364
zinc content and soil pH, 1158
Sorosporum reilianum — see Smut
South Africa
agriculture and vegetational changes, 572
Dep. Agric. Rep. 1954, 300
fodder-beet, 300
Frankenwald Fld Res. Sta. Rep. 1954, 301
groundnuts, 470
maize, 57
South America — see individual States
Southern corn rootworm (*Diabrotica undecimpunctata howardi*), 819
Southern Rhodesia — see Rhodesia
Sowing date — see individual crops
Sowing depth—see also individual crops and seedling emergence, 1377*
Sowthistle
Sonchus arvensis, 602, 1359
S. uliginosus, 1359
Soyabeans (*Glycine soja*) — see also Legumes
after sorghum, 1144
as green manure, 794, 1032
defoliants, effect of, 107
defoliation, 111
fertilizers, 757 — see also nutrition below
fertilizer placement, 1350
floral initiation, 816
flower-drop, 110*
for livestock in Algeria, 464
growth, 817
growth substance, NAA, 816
herbicides, effect of
CIPC, 108, 942
Dinoseb, 108, 1213
IPC, 942
Lion Herbicidal Oil, No. 1, 108
MCPA, 1056
N-1-naphthyl phthalamic acid, 108
PCP, 108
2,4-D, 108, 109, 1056, 1214, 1215
2,4-DB, 1056
in Algeria, 463, 464
in Australia, 466
in Brazil, 105
in USA, 385
insecticides, effect of
Aldrin, 814
Diazinon, 814
Dieldrin, 814
Heptachlor, 814
Lindane, 814
intersown, 588
irrigation (sprinkler), 582
leaf, radiocarbon dioxide translocation, 254
maturity and latitude, 466
nodulation, 467, 485
nutrition, 469, 624, 818,* 977, 978, 1417 — see also fertilizers above
oil content , 1212
plant population, 1035
pod-drop, 110*
pod-setting and defoliation, 111
protein extraction and use, 207
root structure, 468*
rotations, 588, 1146
seed-corn maggot (*Hylemya cil crura*), 814
seed production, 463
seed rate, 813, 1035
seed treatment, 813, 814
seedling quality and water imbib tion, 815
sowing date, 1032
spacing, 299, 813, 1032, 1035, 1420
storage, 814
terramycin effect of, 966
varieties, 466, 811
Biloxi....816
Capitole....467
Chippewa....106
Clemson....812, 1035
Dorman....465
Dortchsoy....465
Earlyana....1212
Grant....106
Harosoy....465
Hawkeye....813, 1212
Hernon 147....1032
Improved Pelican....465
Kouban 0375....467
Lincoln....813, 1212
Mandarin....106
Monetta....812
N 212....299
Nanda....1035
No. 147....299
Norchief....106
Palmetta....812
Ringgit....1420
Rose Selection No. 2....1035
water imbibition and seedling quality 815
weeds in, 1056, 1214, 1370
Spacing — see individual crops
Spain
barley, 455
hemp, 194
oats, 455
rice, 421*
Triticum, new varieties, 251
wheat, 455
Spectrochemical analysis, plants, 617
Speedwell (*Veronica* spp.), 1091
Spergon — see Fungicides
Spergula arvensis — see Spurrey
Sphacelotheca sorghi — see Smut
Spider mites (*Eotetranychus telarius* 539, 897
Spondylocladium atrovirens — see Silv scurf
Spurrey (*Spergula arvensis*), 1091
Stachys palustris, 602
Stellaria media — see Chickweed
Stem borer, 1130
Stem break (*Colletotrichum curvatum* 483
Stem rot (*Leptosphaeria salvinii*) — see Rots
Stem rust (*Puccinia graminis tritici*) - see Rust
Stem-streak necrosis, potatoes, 1278
Stewart's wilt (*Bacterium stewartii*) - see Wilt
Stizolobium spp.— see Velvet beans
Storage, 257, 1210 — see also indiv dual crops
Strangles, 1021

Streptomycin — see Antibiotics
Striga spp.— see Witchweed
Strip cropping, 940
Stripe (*Helminthosporium gramineum*) — see Blight
Strobane — see Insecticides
Stubble mulching, 937,* 1032
Succinic acid, 561
Sudan
  agricultural research, 633
  agricultural survey, 570*
  cotton, 544
  groundnuts, 825
  land use, 570*
  Lupinus termis, 131
  millet, 825
  Minist. Agric. Res. Div. Rep. 1951–2, 297
  rotations, 1345
  soil and water conservation, 1345
Sudan bollworm (*Diparopsis perditor*) — see Bollworm
Sugar-beet (*Beta vulgaris* var. *saccharifera*)
  after barley, 856
  after flax, 856
  after ryegrass, 856
  bolting, 487
  chemical analysis, sampling for, 1260
  chemical composition, 295, 491, 850, 855*, 1006, 1251, 1255, 1260
  cobalt content, 1006
  cold resistance, 854
  defoliation, 850
  diseases, 1417
    black root (*Aphanomyces* sp.), 1237
    A. cochlioides, 853
    Cercospora beticola, 1245
    strangles, 1021
    yellows, 1246, 1247
  double cropping, 1351
  drilling, precision, 135
  earth-cube cultivation, 1351
  fertilizers, 295, 486, 855,* 856, 857, 858, 859, 860, 861, 863, 890, 1237, 1255, 1256, 1257, 1260, 1349, 1417 — see also nutrition below
  fertilizer placement, 857, 860, 1237
  /fodder-sugar-beet, distinction between, 492
  foliar analysis, 863
  foliar applications of fertilizers, 858, 859
  frost damage, 850, 1238
  fungicides, effect of
    Bordeaux mixture, 1245
    copper oxychloride, 1245
  germination, 644, 859, 1248, 1260
  glutamic-acid content, 1255, 1260
  growth, 1260
    and irrigation, 849
    and light and temperature, 1250
    physiology of, 1260
  growth substances, maleic hydrazide, 863, 1259*
  harvesting, 493
  harvesting date, 486, 861, 1242
  hedge windbreak, effect of, 1355
  herbicides, effect of, 1373
    CIPC, 942
    Dalapon, 852
    IPC, 942
    L.T., 488
    P.C.P., 488
  in Belgium, 1241
  in Gt. Britain, 1240
  in Italy, 137, 486
  in USA, 317
    Nebraska, 863
  in USSR, 668
  irrigation, 849, 863, 1417
    spray, 1349
  krilium, effect of, 863
  light intensity and growth, 1250
  microclimate, 1388
  morphology, 490
  nitrate content, 270
  nucleic-acid isolation from leaves, 613
  nutrition, 619, 975, 1237, 1249, 1260 — see also fertilizers above
  on organic soils, 1237
  pests
    aphid (*Myzus persicae*), 1247
    wireworm, 1275
  photoperiodism, 1250
  plant population, 136, 863, 1237
  planting date, 1239
  respiration, 1252, 1260
  root
    development and soil moisture, 1253
    divided, 489
    respiration, 1252
    shape and soil factors, 138
  rotations, 853, 1341, 1342
  seed
    normal and monogerm, 848
    size and yield, 204
    yield, factors affecting, 204, 1239
  seed-bed, 848
  seed production, 136, 490, 859, 1239, 1260
  seed rate, 136, 1021
  seed treatment, 644, 1275, 1417
  seedlings, cold resistance, 854
  singling implement, 1258
  soil moisture, 1253, 1417
  sowing date, 136, 486, 848, 1237
  sowing depth, 848
  spacing, 135, 136, 862, 1237, 1239
  storage, 850, 1259
  sucrose content, 491, 850, 855,* 1251, 1255
  temperature, 491, 1250,
  thinning, 135, 862
  varietal characteristics, 1260
  varieties, 495,* 1241, 1260
    Beta 242/53....141
    Bush E....487
    Bush N....487, 1240
    Desprez TM....486
    Dippe E....1242
    Hilleshög....141
    Hilleshög N....1240
    Johnson's E....487
    Klein....204
    Klein AA....487
    Klein E....486
    Klein E (German)....1240
    Klein E (Sharpe's)....487, 1240
    Klein Polybeta....486
    Kleinwanzleben AA....1242
    Kleinwanzleben E....1242
    Kleinwanzleben N....492
    K.N.B.....487
    Maribo P....486
    Mezzano P....486
    Ovana....492
    Pedigree E....1242
    Polybeta....1257
    SL 828....861
    U.S. 22/3....861, 1251
    U.S. 33....861
    U.S. 35/2....861
    U.S. 400....862
    Webb's No. 2....1240
  water consumption, 1348
  weeds in, 851, 951, 1243, 1244, 1370
    Capsella bursa-pastoris, 1246
    charlock, 644
    chickweed, 644
    Echinochloa crus-galli, 852
    fumitory, 644
    grass, 862, 863
    knotgrass, 644
    Papaver rhoeas, 1246
    Senecio vulgaris, 1246
    Thlaspi arvense, 1246
    wild oats, 644
    wild radish, 644
    willow-weed, 644
  wild, 1260
Sulfenona — see Insecticides
Sulphaguanidine — see Growth substances
Sulphur — see Insecticides
Sulphur dioxide and plants, 998
Sulphuric acid — see Fungicides and Herbicides
Sunflower (*Helianthus annuus*)
  as catch crop, 913
  autumn v. spring sowing, 914
  disease resistance, 562
  double cropping, 1351
  earth-cube cultivation, 1351
  fertilizers, 1008 — see also nutrition below
  fumigants, methyl bromide, 649
  growth substances, effect of
    IAA, 915
    NAA, 915
  herbicides, effect of
    CIPC, 942
    IPC, 942
    2,4-D, 915
  in Queensland, 1337
  in USSR, 562
  nutrition, 619, 980, 981 — see also fertilizers above
  oil content, 562, 913
  rotations, 928
  seed production, 297
  seed treatment, 1028
  sowing date, 913, 914
  sowing depth, 204
  spacing, 1035
  storage, 649
  threshing percentage, 562
  transpiration, 981
  varieties, 562
    Giant Russian, 1035
    Giant White....1028
    Jupiter....1035
    Mars....1028
    Saratovskiĭ....914
    Sortandinskiĭ 41....914
    Striped Gray....297
Sunnhemp (*Crotalaria juncea*)
  as green manure, 300, 1030
  chemical composition, 635
  fertilizers, 557, 635
  germination, 1013

growth, 557,
growth substance, IAA, 557
in Queensland, 1337
in Rhodesia and Nyasaland, 1031
photoperiodism, 557
seed treatment, 557
sowing date, 557
stembreak (*Colletotrichum curvatum*), 483
vernalization, 557
var. C.12....557
Swaziland Irrigation Scheme, 770, 938
Swedes (*Brassica napus* var.)
club-root (*Plasmodiophora brassicae*), 509
fertilizers, 278, 890 — see also nutrition below
nitrate content, 270
nutrition, 975, 1417 — see also fertilizers above
plant population, 141
rape, crossed with, 1002*
root maggots
Hylemya brassicae, 496
H. floralis, 496
salt tolerance, 921
soil moisture, 1261
sowing date, 141
varieties
Hoffmann's Weisse Riesen....141
White Milan....1261
Sweden
cereal-grain drying, 101
peas, 122, 476
seed production, 286
soyabeans, 811
Sweet clover (*Melilotus alba*), 1063
rotations, 1119
Sweet-potatoes (*Ipomoea batatas*)
as catch crop, 650
chemical composition, 175, 177
cicatrization, 1299
fertilizers, 650
herbicides, effect of 2,4-D, 172
in Japan, 171
leaching, 1389
nutritive value, 177
pests
weevils
Cylas formicarius elegantulus, 523, 887
Rhyssomatus near *subcostatus*, 173
wireworm (*Conoderus* spp.), 886*
pre-storage treatments, 1299
riboflavin determination, 176*
root formation, 174
storage, 1299
varieties
B5941....522
Caroline Lea....1034
C.S.K. 8....1034
C.S.K. 9....1034
C.S.K. 17....1034
C.S.K. 21....1034
F.A. 17 White....673
Hawaiian....1299
Kansansa....1034
Kayamba....1034
Locale....1034
Ndele....1034
Norton Sam....1034
Porto Rico....1299
Ranger....522
Takanaka....1034
UPR 3....523
Yellow Jersey....1299
Sweet-potato weevil (*Cylas formicarius elegantulus*) — see Weevils
Switzerland
Eidg. Agrikulturchem. Versuchsanst., Liebefeld-Bern Rep. 1954, 1024
Eidg. Landw. Versuchsanst., Zürich-Oerlikon Rep. 1954, 1023
farm transport, 288
peasant farms, 922
Synchytrium endobioticum — see Potato wart
Take-all (*Ophiobolus graminis*), 21, 302, 1073, 1074
Tanganyika Dep. Agric. Rep. 1954, 1030
TCA — see Herbicides
TCNB — see Growth substances
Teff (*Eragrostis abyssinica*), 1027
Tephrosia candida, 296
Terramycin — see Antibiotics
Tetramethyl thiuram disulphide — see Fungicides
Thistles (*Cirsium arvense*), 602, 1056, 1091, 1372
Thlaspi arvense, 1246
Thorn trees, 1366
3-amino-1,2,4-triazole — see Growth substances
3,4,D — see Herbicides
Thymelaea passerina, 946
Til (*Sesamum indicum*) — see Sesame
Tilletia brevifasciens — see Smut
Titanium, in plants, 267*
TMTD — see Fungicides
Topine (*Helianthus tuberosus* × *H. macrophylla*), 1023
planting date, 1417
Trash farming, 1032
Tribolium spp.— see Flour beetles
Tributon — see Herbicides
Triticum spp.— see also Wheat
new varieties, Spain, 251
Tropotox — see Herbicides
TTC, 256*
Tur (*Cajanus indicus*) — see Pigeon pea
Turkey, agriculture, 220
Turnips—see Swedes
Turnip rape (*Brassica campestris* var. *oleifera*) — see Rape
Tussilago farfara, 602
2,3,5-tri-iodobenzoic acid — see Growth substances and Herbicides
2,4-D — see Growth substances and Herbicides
2,4-DB, 2,4,5-T — see Herbicides
2,4,5-TCPP — see Growth substances
2,4,6-T,1132
Typha spp.— see Cattails
U46 — see Herbicides
Ubangi-Shari, savannahs, 1347
UD-55 — see Herbicides
Uganda
Dep. Agric. Rep. 1954, 1029
rainfall assessment, 1016*
soil fertility maintenance, 1029
Urena lobata
retting, 1034
seed storage, 257
Urtica dioica — see Nettles
USA
Arkansas
cereals, freezing damage to, 798
soil and water conservation, 936
California, rice, 422
cotton-growing, mechanization, 190
Dakota (North), soil temperature, 1344
Dakota (South), weeds, 952
Florida Agric. Exp. Sta. Rep. 1954, 652
Kansas
Fort Hays Br. Sta. Rep. 1953–4, 1025
rotations, 1343
sorghum, 1143
maize, 385
Nebraska, sugar-beet, 863
Oklahoma, irrigation, 931
plant ecology, 1426
seed certification standards, 285
sorghum, 385
soyabeans, 385
Texas
Blackland Exp. Sta., soil and water conservation, 935*
water evaporation studies, 1357
Utah, safflower, 912
weed control, 317
USSR
agricultural survey, 214
agriculture in perpetual frost zone, 222
flora, 307,* 308*
groundnut husks, 475
Jerusalem artichoke, 179
land planning, 215*
land reclamation, 923
maize, 61, 62, 385, 388, 389, 390, 391,* 392,* 393,* 398, 738,* 739
rice, 1164
rotations, 668
seed-potato production, 504
snow conservation, 224
sugar-beet, 668
sunflower, 562
weeds, soil-N detection, 694
wheat, 1, 679
zonal advisory commissions, 669
Vallisneria spiralis, 239
Velvet beans (*Stizolobium* spp.)
as cover crop, 1030
as green manure, 299, 300
germination, 1013
rotations, 299
varieties
J 52....1030
No. 5....299, 1032
No. 16....1032
No. 52....1032
No. 77....1032
Somerset....1030
Venezuela
Cent. Agron. Res., Maracay, 326
Euphorbia lathyrus, 1335
Vernalization — see individual crops
Veronica spp.— see Speedwell
Verticillium wilt —see Wilt
Vetch (*Vicia* spp.)
as cover crop, 415, 936
as green manure, 856
before wheat, 1082
in Germany, varieties imported compared, 847

mixtures, 226*
root/shoot ratio, 1007
seed production, 130
varieties
Gravicker....130
Nordsaat....130
Sötvicker....130
V. villosa, 843
Vicia faba — see Beans
V. sativa } see Vetch
V. villosa }
Vetiveria zizanioides as cover crop, 589
Vigna sinensis — see Cowpeas
Viola tricolor — see Heart's-ease
Virus diseases, 287, 1023, 1246, 1247, 1276, 1277 — see also individual diseases
Vitamin B, 100, 134*
Voandzeia subterranea — see Bambarra groundnut

Water
evaporation studies, Texas, 1357
in agriculture, 1044
salt, for irrigation, 310
use by plants, 1386
Water couch grass (*Paspalum distichum*), 239, 240
Water hyacinth (*Eichhornia crassipes*), 593, 675, 949
Water milfoil (*Myriophyllum propinquum*), 239, 240
Weather — see also Climate
and plant growth, 1385
maize, 60
wheat, 682
hail control, Italy, 584, 1053
in Gt. Britain, 1041
insolation, 1410
lightning damage to cotton, 540
meteorological records, Belgian Congo, 1018*
meteorological services, Gt. Britain, 1041
rainfall
and cotton, 530
and millet, 1029
assessment, 641, 1016*
prediction, 1409
wind damage, rice, 426
wind erosion, Fens, 585
Weedone — see Herbicides
Weeds, 1429*, 1430*
aquatic, 238, 239, 240, 297, 593, 675, 949, 1364, 1368
combine-harvester, effect of, 802
common names — see also scientific names below
annual blue grass, 1370
barley grass, 675
bindweed, 1025
bracken, 944
brigalow, 950, 1035
buttercup, 602
button weed, 239, 240
camel-thorn bush, 594
cane grass, 240
cape weed, 1422
carpet weed, 1370
cattail, 947, 1368
charlock, 644, 1302, 1422
cheatgrass, 1370
chickweed, 644, 1091
cocksfoot, 1368
couch, 233, 234, 944, 1365, 1422
crabgrass, 1370
cumbungi, 239
dock, 675
evergreen thicket, 1367
fat hen, 694, 1091, 1302
foxtail, 1370
fumitory, 644
gorse, 675
grass, 862, 863, 1173, 1368, 1371
heart's ease, 1091
hemp nettle, 1362
Jerusalem artichoke, 526
Johnson grass, 1311
Kentucky bluegrass, 1368
knotgrass, 644, 1091
leafy spurge, 1361
mustard, 648
nettle, 602
onion twitch, 1422
onion weed, 595, 1422
pigweed, 1370
purslane, 1370
quack grass, 1368
quickgrass, 236
ragwort, 675
red rice, 1172
redshank, 646, 1091, 1302
rushes, 239
sand rocket, 596
scrub, 675
sedges, 1368
seid grass, 1364
skeleton weed, 656, 1360
sowthistle, 1359
speedwell, 1091
spurrey, 1091
thistles, 602, 1091, 1372
thorn trees, 1366
twitch, 944
water couch grass, 239, 240
water hyacinth, 593, 675, 949
water milfoil, 240
wild mustard, 1070, 1323
wild oat, 235, 644, 942, 943, 1228, 1358, 1370, 1371, 1417
wild radish, 644, 1422
wild rice, 1171
wild turnip, 1422
willow, 239, 240
willow-weed, 644
witchweed, 297, 298, 764, 1364
ecology, Italy, 250
fallow howing, 297
handbook 1956, 1374
in Australia, 675
in Canada, 598
in drains, 239, 240, 675
in Gt. Britain, 675, 1040
in India, 241
in Italy, 250
in irrigation channels, 239, 240
in Kenya, 1367
in New Zealand, 675
in Rhodesia, 1427
in USA, 317, 952
scientific names — see also common names above
Acacia harpophylla, 950, 1035
Acanthospermum hispidum, 894
Aegopodium podagraria, 602
Agropyron repens, 233, 234, 602, 944, 1365, 1368
Agrostis spp., 944
Alhagi camelorum, 594
Alisma plantago, 80
Alopecurus spp., 1370
A. geniculatus, 80
Amaranthus spp., 1371
Anthriscus silvestris, 602
Artemisia absinthium, 694
Asphodelus fistulosus, 595
Avena fatua, 235, 943, 1358, 1370
A. ludoviciana, 235, 1417
Azolla sp., 240
A. filiculoides, 239
Berberis vulgaris, 953
Brassica arvensis, 1070, 1323
B. sinapis, 1302
Bromus secalinus, 1370
Canna glauca, 82
Capsella bursa-pastoris, 599, 1246
Cassia floribunda, 1034
Centaurea picris, 1372
Chara globularis, 297
Chenopodium album, 694, 1091, 1302
Chondrilla juncea, 656, 1360
Cirsium arvense, 602, 1091, 1372
Commelina nudiflora, 1034
Convolvulus arvensis, 1025, 1372
Cotula coronopifolia, 240
Cynodon sp., 236
Dactylis glomerata, 1368
Deschampsia caespitosa, 602
Digitaria spp., 184, 1370
Diplotaxis tenuifolia, 596
Echinochloa colonum, 82
E. crus-galli, 852, 942
E. crus-pavonis, 82
Eichhornia crassipes, 593, 949
Eleocharis acuta, 239
Eleusine indica, 1128
Equisetum arvense, 602, 694
Euphorbia spp., 1371
E. esula, 1361
Filipendula ulmaria, 602
Fimbristylis miliacea, 82
Galeopsis pubescens, 1362
G. tetrahit, 1362
Imperata cylindrica, 1345
Ipomoea involucrata, 1034
Ischaemum rugosum, 82
Juncus articulatus, 239
Jussieua spp., 82
Lantana camara, 298, 1366
Leptochloa scabra, 82
Linaria vulgaris, 237
Matricaria chamomilla, 233
M. inodora, 599
Mimosa pudica, 651
Myriophyllum elatinoides, 239
M. propinquum, 239
Najas spp., 1364
Panicum spp., 80
Papaver rhoeas, 1246
Paspalum dilatatum, 240
P. distichum, 239, 240
Phragmites communis, 240
Physalis angulata, 82
Poa annua, 1370
P. pratensis, 1368
Polygonum spp., 233
P. aviculare, 1091
P. latifolium, 694
P. persicaria, 646, 1091, 1302, 1417
Potamogeton sp., 80, 239, 1364
P. crispus, 297
Pteridium aquilinum, 602, 944
Ranunculus repens, 602
Salvinia auriculata, 948, 1363
Senecio vulgaris, 1246

Setaria spp., 1324
S. lutescens, 942
S. viridis, 942
Solanum elaeagnifolium, 597
Sonchus arvensis, 602, 1359
S. uliginosus, 1359
Sorghum halepense, 945*, 1311
Spergula arvensis, 1091
Stachys palustris, 602
Stellaria media, 1091
Striga sp., 297, 298
S. hermonthica, 764, 1364
Thlaspi arvense, 1246
Thymelaea passerina, 946
Tussilago farfara, 602
Typha spp., 947
T. angustifolia, 239
Urtica dioica, 602
Vallisneria spiralis, 239
Veronica spp., 1091
Viola tricolor, 1091
Weidela trilobata, 651
seeds, 955
in crop seed, 284
in stable manure, 249
soil-N depletion, 694
Weevils
Ceuthorrhynchus assimilis, 564
Cylas formicarius elegantulus, 523, 887
Pachymoerus cassiae, 825
Rhyssomatus near *subcostatus*, 173
Sitophilus granarius, 711
S. oryzae, 761
Weidela trilobata, 651
Wheat (*Triticum* spp.)—see also Cereals
acreage changes in Australia, 677
adaptation, 342
after fallow, 3, 331
after legume, 1082
after pasture ley, 656
after ploughing, 1024
after potatoes, 1073
amino acids in roots, 1079
awns and yield, 26
branched, and irrigation, 1067
carbohydrate formation and growth, 699
chemical composition, 5, 295, 461, 699, 1035, 1079, 1196
climate and yield, 94
combine-harvested, 690
cultivation value, 1087
diseases
blight (*Helminthosporium sativum*), 458
eyespot (*Cercosporella herpotrichoides*), 348, 1072, 1073
mould, 1207*, 1209*
rust (*Puccinia graminis*), 98, 323, 649, 800, 1023, 1028
smut (*Ustilago tritici*), 347, 695
take-all (*Ophiobolus graminis*), 21, 302, 1073, 1074
yellow berry, 352
drainage and yields, 649
drilled *v.* dibbled seed, 1059
drought resistance, 381
ear production and temperature, 648
earliness and epidermal characters, 355
evapotranspiration, 330, 682
fertilizers, 31, 32*, 295, 348, 352, 359, 357, 360, 618, 644, 648, 698, 701, 709, 710, 857, 1028, 1063, 1064, 1067, 1073, 1081, 1082, 1349, 1417, 1418 — see also nutrition below
fertilizer placement, 857
foliar spraying, 5, 359
frost damage, 1061, 1062
fumigants, effect of
ethylene dibromide, 1086
mercury vapour, 364
germination, 19, 294, 343, 363, 456, 458, 689, 690, 691, 692, 797
green manures, *Calotropis procera*, 1083
growth, 699, 1076, 1077, 1078
growth period, Norway, 335
growth substances, effect of
IAA, 358
NAA, 358
2,4-D, 358, 1069
harvesting, 690, 1211
harvesting date, 797
herbicides, effect of, 675, 1071
Agroxone, 97
CDAA, 1369, 1370
CDDA, 1370
CDEA, 1370
CDEC, 1370
CIPC, 942
DCPA, 346
diethyl dithio carbonate, 1080
DNOC, 247
IPC, 942
MCPA, 346, 693
TCA, 30, 1346
2,4-D, 358, 693, 1069
Weedone, 97
in Australia, 677
New South Wales, 687, 950
Queensland, 687, 950, 1337
Victoria, 4, 710*
in Belgium, 1065, 1066
in Colombia, 365*
in Czechoslovakia, 332
in Egypt, 676
in Fezzan, 339
in Italy, 323, 337, 1052
in Kenya, 800
in Morocco, 18
in Mozambique, 1432
in Norway, 335
in Peru, 341
in Rhodesia and Nyasaland, 1031
in Spain, 455
in USSR, 679
in Yugoslavia, 338
insecticides, BHC, 1401
irrigation, 698, 1067
spray, 1349
sprinkler, 582, 680
leaf
-area and iron, 697
-area, -length, -width and dry weight, 804
chemical composition, 295
lodging, 348
mixtures, 225*
moisture determination, 1014
mycorrhiza development, 459
nitrate assimilation and light, 354*
nitrite metabolism, 982
nutrition, 29, 264, 356, 619, 696*, 701, 975, 977, 978, 1076 — see also fertilizers above
on sandhills, 710
pests, 1084
Aelia germari, 350
bulbfly (*Leptohylemia coarctata*), 1417
cutworm (*Agrotis orthogonia*), 1075
flour beetles
Tribolium castaneum, 1085
T. confusum, 711, 1085
granary weevil (*Sitophilus granarius*), 711
stem sawfly (*Cephus cinctus*), 349
wireworm (*Agriotes* spp.), 351, 647
photoperiodism, 703, 704, 705, 1077, 1201
photosynthesis and light, 354*
photothermic quanta, determination, 703
plant population, 2, 653
protein, 5, 1035, 1196*
rabbit damage, 1198
rainfall, effect of, 330
respiration, 24*, 700, 701, 797, 1195
root/shoot ratio, 1007
rotations, 3, 300, 302, 588, 656, 678, 928, 1063, 1341, 1342
salt tolerance, 921
seeds
BHC absorption, 1401
cold-stored, changes in, 344
drilled *v.* dibbled, 1059
excretions from, 801
growth, 25
maturation and solar radiation, 648, 797
nitrogen content and fertilizers, 295
quality and soil fertility, 1009
seed rate, 338, 348, 458, 653, 1031, 1035, 1059, 1072, 1064, 1190
seed shedding, 797
seed source and yield, 681*
seed treatment, 345, 347, 351, 358, 363, 458, 647, 692, 695, 704, 1068, 1069, 1417
seedlings
BHC absorption by, 1401
cytochrome-oxidase content, 970
frost-heaving damage, 1060
oxidase inhibition, 1080
snow cover, 1061
soil, and protein content, 1035
soil density and yield, 1*
soil moisture, 330
soil pH, 708
soil structure and germination, 343
sowing date, 332, 342, 349, 453, 454, 679, 704, 1023, 1025, 1031, 1069, 1077, 1190, 1418
spacing, 338, 796, 1076
starch estimation, 461
stem population, 2
storage, 104, 344, 361*, 362, 363, 364, 690, 711, 1084, 1085, 1086, 1207*, 1208*, 1209
stubble-burning, 3
temperature, 648, 706, 1079, 1201
tillering and soil structure, 2
T. aestivum
classification, 353
sterile base florets, 27*
wild mustard in, 1070
ssp. *compactum*, 353

ssp. *macha*, 353
ssp. *spelta*, 353, 1065
ssp. *sphaerococcum*, 353
ssp. *vulgare*, 353
T. durum, 686, 688
var. Senatore Cappelli....337
T. turgidum compositum, 28
T. vulgare ligulatum muticum varieties, 1065
undersown, 649, 796, 1028, 1063
varietal classification, 1065
varietal identification, 1065
varietal testing, 1059
varieties, 8,* 12, 338, 686, 687, 800
Albidum....1065
Albidum 3700....679
Alfy....1066
Ariana....455
Ås....334
Ås II....1195
Atle....6, 7, 9, 293, 454, 645, 647, 690, 1022, 1193
Atle Elite....6
Atson....6
Autonomia....336
B49-90....349
Baart....340, 347
Baladi 116....676
Baldrock....1060
Bellevue....1066
Bencubbin....656
Bersee....6, 7, 348, 1072
Big Club 43....1105
Blanco de la Molina....341
Blé d'Avril....1066
Brevor....347
Brons....6, 7, 9, 334
C.591....1068, 1069
Canadian Redman....1023
Capella....649, 1028
Cappelle....13, 684, 1023, 1073
Cappelle Desprez....16, 645, 1066, 1072, 1192
Cappelli....323, 336, 685
Charter....1035
Cheyenne....17
Chinese....705
C.I.12733....349
Coker's 47-27....652
Comanche....17, 340, 1025
Concho....340, 1025
Cross 7....693
Cross 318....649
Dakar 42....676
Dakar 49....676
Damiano Chiesa....337
DC x Ceres....649
DC x Ceres R64....649
Diamant....694
Diamant II....97, 334, 797
Dromedaris....300
Drott....683, 797
Eclipse....645
Ella....6, 293, 647, 1193
Elmar....347
Erli....1023
Eroica....1080
Erythrospermum....25
Est Mottin....336
Federation....347, 1105
Federov....704
Festival....1035
Florau....323
Florence-Aurore....455
Fortunato....337
Fram II....334
Franc Nord....16
Frisco....340
Funo....323, 336, 337
Fylgia....6, 7, 9, 10, 704
Gabo....1035
Gabo x 3 Dirk (726)....302
Garnet....352
Generoso....336
Giza 135....676
Giza 139....676
Glasnevin Rosa....645
Granadero Klein....1028
Grifoni 235....685
Hauter's II....704
Heines 7....1023, 1066
Helvia....341
Hohenhauer Kolben....333
Holdfast....1073
Huron....1023
Hybrid 46....644, 645, 1072, 1192
Idaed....347, 1105
Impeto....337
Jakutjanka....1079
JC 73....1034
Jufy I....10, 1066
Jufy II....10, 1066
Juliana....1072
Kahetinskaja....1067
Karn....6
Karn II....9, 97, 293, 334, 1022, 1193
Kentana 48....340
Kenya Governor....22, 1031
Kimmo....797
Kiowa....1025
Kiska....1034
Kisozi (145)-7....1034
Koga II....1417
Kooperatorka....1077
Kubanka 3....11*
Lalkasarwali....300
Langdon....688
Later....645
Lawrence....1035
Leda....1066
Lemhi....1105, 1190
Lichti 1....1023
Lutescens....1065
Lutescens 62....701
Lutescens 0329....1077
Mahmoudi III....704
Mahmoudi 552....704
Manitoba x Probstdorfer Kolben....333
Mara....336, 337
Marfed....347
Marquis....352
Mariache....341
Marina....341
Melanopus 69....1067
Mentana x *Aegilops ovata*....323
Meteor....6, 7, 9
Mida....98
Mida Cadet....1028
Milturum....1065
Milturum 321....679
Milturum 553....679
Mindum....352
Minhardi....1060
Minister....645
Mø 043-40....334
Mokhtar Improved....676
Montcalme 245....13, 684, 1023
Moskova....1077
Moskovskaja 02453....1077
N. 59....16
Nebred....17
Neusaat....333
No. 65....15
No. (130))-1-77....1034
No. 131....22
No. 354....1028
No. 356....1028
No. 358....1028
No. 26 A 14....1031
No. 359 AA.8.B.I.A....1028
No. 351.AS.1.B.2....1028
No. 356.A.2A(356.B)....799
No. 358.AA.5.B....799
No. 362A.1.D.1....1028
No. 294 B2 A3....1030
No. 356.B(356A.2A)....799
No. 362B.1....1028
No. 362 B.1.A.3....1028
No. 362 B.1.A4....1028
No. 362.B.1.E.4....799, 1028
No. 3225 Biskri x Bouteille....18
No. 341F2D1....1030
No. 341F2D2....1030
No. 360 F8X....649, 1028
No. 291J111....1030
No 2777 Kyperounda....18
No. 360 H....649
No. 44/W/34....1030
Noe....1077
Nord Desprez....1192
Norrøna....334
N.P.52....703
N.P.165....355
Onas 53....340
Panter....1066
Pawnee....17, 340
Pb. 8-A....355
Petit Quin Quin....645
Phoebus....1066
Pilot....16
Pirana....323
Pondus....1022
Probus....13, 684, 1023
Progress....6, 293, 647, 1022, 1193
Providence....295
Punjab....300, 1418
Puora....1035
Pusa 4....1031
Quanah....340
Queen Fan....300
R.37....336, 337
R.64....649
Ramsey....688
Red Bobs....352
Redman....1023
Red Spitzkop....1418
Regent....352, 1023
Rescue....349
Roberto Forlani....14
Roma....336
Russello....323
Rustique....1066
Sabanero....649
Sabi X 1....1031
Salto....336, 1023
San Pastore....336, 337
Seafoam....1035
Sel.1/52....645
Sibir....335
Skirne....334
Snøgg II....334
Spica....1035

Squareheads Master....348
Tammi....797
Tenmarq....17
Thatcher..349, 352
Towner....688
Triumph....340, 1025
Ukrainka....702
Vivenza....336
Westar....17
White Spitzkop....1418
Wichita....17, 1025
Wit Klein....300
Yamalan....341
Yeoman....645
Yga....645
Yga Blondeau....16
Yuma....688
ventilating system, 969
vernalization, 332, 460, 702, 703, 706, 1077
water supply and growth, 1078
weather, effect of, 682
weeds in, 653, 693, 1071
bindweed, 1025
wild oats, 1417
weeds and soil-nitrogen deficiency, 694
winterhardiness, 332, 1061, 1077
X-rays, effect of, 377*
Wheat stem sawfly (*Cephus cinctus*), 349
Whitefly (*Bemisia gossypi-perda*), 898
Wild mustard, 1070, 1323
Wild oats (*Avena* spp.), 644, 942, 1228, 1371
A. fatua, 235, 943, 1358, 1370
A. ludoviciana, 235, 1417
Wild potatoes (*Commersoniana*) spp., 1282
Wild radish, 644, 1422
Wild rice, 1171
Wild turnips, 1422
Willcox's yield/nitrogen law, 627, 628
Willows, 240
Salix babylonica, 239
S. fragilis, 239
Willow-weed, 644
Wilt
Bacterium stewartii, 1132
Fusarium solani, 1314
Piricularia oryzae, 83*, 437
Rhizoctonia sp., 543
Verticillium sp., 501*
Wilting method, 1390
Wind — see Weather
Windbreaks, 227, 228, 933, 1354, 1355
Wireworms, 292, 647, 1275
Agriotes sp., 351
Conoderus sp., 819, 886*
Limonius canus, 873
Witchweed (*Striga* sp.), 298
S. hermonthica, 764, 1364
X-521 — see Fungicides
Xanthomonas malvacearum — see Blight
Xanthosoma saggitifolium — see Cocoyams
X-rays and wheat, 377*
Yams (*Dioscorea* spp.), 296
chemical composition, 177
D. dumetorum, 177
fertilizers, 651, 888
in Mexico, identification, 524
nutritive value, 177
varieties
Bottleneck Lisbon....650
Joka....650
Mondoo....650
Yellow berry, 352
Yield/nitrogen law, 627, 628
Yugoslavia, agricultural economy, 313
Zanzibar
Dep. Agric. Rep. 1954, 650
land use, 212
Zea mays — see Maize
Zineb — see Fungicides

ANNUAL AUTHOR INDEX, VOL. 9, 1956

References are to abstract numbers. R.A.=Review article.

Aastveit, K., 1195
Abel, A. L., 234, 1365
Abela, M. M., 194
Åberg, E., 153, 317
Abhyankar, V.S., 1156
Abraham, T. P., 1189
Acad. Sci. Poland, 973
Acocks, J. P. H., 572
Acosta, A., 98
Adams, S. N.,962
Addens, N. H. H., 286
Addison, H., 1043
Addor, A. A., 105
Aebi, H., 1273
Africa
  Basutoland Dep. Agric., 1418
  Bechuanaland Dep. Agric., 1033
  Comm. Tech. Co-op. Africa South of Sahara, 568, 569, 577, 637, 638, 639, 640
  East Afr. Agric. For. Res. Org., 1027
  East Africa Roy. Comm., 1026
  Egypt Minist. Agric., 676, 1163
  Frankenwald Fld Res. Sta., 301
  Gold Coast Dep. Agric., 1419
  INEAC, 1018, 1034
  Inter. Afr. Soils Conf., 1954, 760, 929
  Kenya Dep. Agric., 649, 1028
  Morocco. Dir. Agric. For., 686
  Nigeria (North.) Dep. Agric., 926
  Rhodesia (North.) Dep. Agric., 298
  Rhodesia (South.) Agric. Exp. Sta. Salisbury, 299, 1032
  Rhodesia and Nyasaland Minist. Agric., 1031
  South Africa Dep. Agric., 236, 300, 1140, 1398
  Sudan Minist. Agric. Res. Div., 297
Sudan South Devel. Invest. Team, 510
  Tanganyika Dep. Agric., 1030
  Uganda Dep. Agric., 1029
  West Afr. Maize Rust Res. Unit, 401
  West Afr. Rice Comm., 93
  Zanzibar Dep. Agric., 178, 650
Agric. Inst. Allahabad, 653
Agric. Res. Inst. N. Ireland, 646
Agron. trop., Nogent, 1338
Ahmad, G., 346
Akeley, R. V., 148, 1264
Åkerberg, E., 286, 476
Åkerman, Å., 286, 366
Akour, A. A., 131
Alexander, J. T., 1260
Alieva, Z., 181
Alim, M., 793
Allan, A. H., 609
Allen, H. P., 675
Allen, P. J., 1394
Allerton, F. W., 265
Alley, H. P., 1244
Allied Powers H. Q., 145, 171
Allison, F. E., 317
Allison, R. V., 652
Almeyda, E. L., 32
Althoff, W., 1258
Altona, R. E., 301
Amaral, J. D., 1039
Amer. Soc. Sug. Beet Technol., 863, 1260
Amershahi, M. C., 1093
Andersen, R. N., 943
Anderson, D. M. W., 42
Andersson, Y., 476
Andrew, R. H., 1123
Angladette, A., 421
Angulo, B. M., 59
Anson, R. R., 543
Anthony, K. R. M., 1345
Anyane, S. L., 1339
Appert, J., 825
Arant, F. S., 819
Arashi, K., 782
Argentina Minist. Agric., 104
Argikar, G. P., 1352
Arikado, H., 445, 732, 969
Arkansas Agric. Exp. Sta., 936
Arland, A., 606, 1390
Arle, H. F., 1312
Arnoux,—423
Arny, D. C., 54
Aronoff, S., 254
Arthur, B. W., 819
Arthur, I. P., 610
Artschwager, E., 1260
Arutjunova, L., 187
Åsander, F., 53
Ashcroft, R. T., 1110
Athow, K. L., 813
Atkins, I. M., 26
Atkins, R. E., 384
Aufhammer, G., 1102
Aula Dei Esta. Exp., 455
Australia
  CSIRO, 466, 655, 1084
  New South Wales Dep. Agric., 656
  Queensland Dep. Agric. Stock, 1035
  Queensland Dep. Publ. Lands, 219, 573
  State Rivers and Water Supply, Comm., 239, 240
  Tasmania Dep. Agric., 1422
  Waite Agric. Res. Inst., 302
Avakjan, A. A., 739, 1200
Azariah, M. D., 497
Azzi, G., 1425
Baba, I., 775, 780, 788
Bacon, J. S. D., 1394
Baden, W., 883
Baer, R. van, 1417
Bagge, H., 549
Bahteev, F. H., 303
Baker, L. O., 1346
Baker, V.H., 711
Balfour, P. J., 675
Baljura, V.I., 738
Balks, R., 270
Ball, N. G., 1402
Ballard, L. A. T., 1360
Ballatore, G. P., 842, 1242
Baltazar, E. P., 1307
Baltin,—581
Banerjee, B., 195
Banfield, G. L., 675
Barbacki, S., 482
Barbe, M., 766
Barley, K. P., 1186
Barnard, C., 27
Barnes, H. F., 1045
Baron, M., 825
Bartholomew, R. P., 936
Barton, Nancy L., 981
Basutoland Dep. Agric., 1418
Bates, R. P., 60
Batts, C. C. V., 1004, 1072
Bauer, D., 1211
Baumann, H., 1078
Bauserman, H. M., 611
Bawden, F. C., 287
Bayle, M., 766, 825
Beadle, N. C. W., 1392
Bechuanaland Dep. Agric., 1033
Beckett, W. H., 1339
Bederker, V. K., 532
Beesley, D. W., 1081
Beevers, H., 970
Belgium, Inst. Internat. Rech. Betteraave, 135
Belikov, I. F., 111, 817
Bell, J. E., 675
Bell, R. A. M., 37, 48
Benitez B., A., 1363
Bercks, R., 1276
Berdyšev, A. P., 562
Beretta, O., 132
Berger, X., 1051
Bergström, C., 40
Berthélem, P., 1232
Bertrand, G., 985
Bhardwaj, S. N., 345, 358, 1068, 1069, 1233
Bhargava, P. N., 266
Bhatt, J. G., 1318
Bhavani Shanker Rao, M., 471
Bhuvaneswari, K., 614
Biddulph, O., 262
Bighi, C., 1249
Bills, G. T., 126
Bingefors, S., 477
Birk, L. A., 958
Bjaanes, M., 334
Black, C. A., 627
Blackett, R. D., 864
Blackith, R. E., 1227
Blackman, C. R., 796
Blagoveščenskiĭ, 344
Blake, G. R., 498
Blanc-Aicard, D.,965
Blanchard, F. A., 71
Blanchard, M., 463, 464
Blanchard, R. A., 762
Blanck, F. E., 657
Blaszyk, P., 954
Bleton, C., 209
Bloodgood, D. W., 1357
Bockman, H., 21
Bohmont, D. W., 1244
Boken, Else, 1096
Bollaerts, D., 1206
Bolle-Jones, E. W., 975
Bolli, M., 1011
Bollman, W., 1275
Bonde, R., 1271
Bondi, A., 102
Bonnemaison, L., 564
Bonner, J., 957
Bonnier, C., 467
Borner, H., 801
Bouffil, F., 825
Boulanger, J., 541
Boulware, J. H., 171

Bovay, E., 1051
Bowen, H. J. M., 987
Bradbury, F. R., 1401
Bradley, G. A., 149
Brandolini, A., 65
Brauer, A., 882
Brazil
Inst. Agron.do Sul, 290
Serv. Inform. Agric., 105
Brian, P. W., 125, 625
Bridges, R. G., 1086
Briggs, F. N., 340
British Guiana Dep. Agric., 1420
British Weed Control Council, 1374
Broadbent, L., 1417
Brouwer, W., 1349
Brown, C. W., 687, 714
Brown, C. M., 1094
Brown, F. A., 513
Brown, J. C., 90, 977, 978
Brown, L. C., 182, 891
Brown, R., 1234
Brücher, H., 1282
Bruel, W. E. van den, 1206
Buchanan, K. M., 1037
Buchholtz, K. P., 830
Bugueño, V. V., 204
Bulat, H., 256, 456
Bull. Agron. Fr. d'Out. mer, 766, 825
Bull. Inform. INEAC, 528
Bullen, E. R., 12, 643, 1081
Bunting, A. H., 820
Bunting, E. S., 1329
Burrows, V. D., 1070, 1323
Burström, H., 273
Burton, M. V., 583
Burton, W. G., 166
Burvill, G. H., 1336
Bykovec, A. G., 225
Cabral, A. L., 578, 825, 927
Caestecker, K. de, 2
Čaĭlahjan, M. H., 702
Calcagnolo, G., 539, 896, 897
Calder, A., 139
Caldwell, R. M., 813
Caldwell, T. H., 636
California Agric. Exp. Sta., 190
Callbeck, L. C., 1278
Calton, W. E., 212
Cameron, D. G., 230
Cammack, R. H., 401
Canada Dep. Agric., 598
Cangardel, H., 350
Cano, J. G., 200
Cantillon, P., 130
Caputa, J., 741, 742
Carpenter, K., 242
Carr, D. J., 258
Cartter, J. L., 1212
Castle, M. E., 143
Cavell, A. J., 269
Celykovskiĭ, P.G., 389
Cent. Agron. Res., Maracay, 326
Cent. Appenninico Terminillo, Italy, 322
Cent. Cott. Cttee, India, 547
Cent. Invest. Agron., Venezuela, 73
Cent. Rice. Res. Sta. India, 452
Chalam, G. V., 439
Chalmers, G. H., 809
Chamberlain, G. T., 634
Chandnani, J. J., 1304
Chandraratna, M. F., 92, 422
Chang, C. W., 1319
Chapman, H. W., 159
Chapman, W. H., 718
Chaudhari, B. B., 1148
Chaudhury, M. S., 436
Chaugule, B. A., 1146
Chavan, V. M., 1145, 1147, 1149, 1150, 1151, 1153, 1160
Chaves, S.M., 709
Chinoy, J. J., 703
Christensen, C. M., 1112, 1208
Christidis, B. G., 183, 304, 534
Christiensen, C. M., 362
Church, B. M., 1198
Clarke, E. A., 675
Claver, F. K., 152
Clegg, K. M., 99, 461
Clérin, M., 825
Coaker, T. H., 1130
Cochrane, D. G., 1367
CoCoBro, Neth., 19, 294
Cohic, F., 199
Coiteux, F., 1243
Coleman, F., 309
Collin, F. H., 675
Collin, J.-L., 1330
Collins, F. I., 1212
Collister, E. H., 1328
Colon. Agric., Anim. Health, For. Res. Cttee, 1406
Colon. Office, 217
Colon. Prod. Coun., 1407
Colorado Agric. Exp. Sta., 1341
Comar, C. L., 661
Comm. Tech. Co-op. Africa South of Sahara, 568, 569, 577, 637, 638, 639, 640
Commonw. Econ. Cttee, 306
Connold, W. Q., 1302
Cooke, G. W., 806, 932, 1417
Coons, G. H., 317, 1254, 1260
Cooper, J. P., 1201
Cormany, C. E., 855, 863
Cornford, C. E., 144, 1417
Corns, W. G., 854
Costin, A. B., 574
Cott. Res. Inst. Sindos, 534
Coun. Sci. Industr. Res. India, 305
Coupland, R. T., 1361
Coury, T., 1315
Covell, M., 1271
Cox, A. E., 154
Cox, H. C., 753
Criddle, W. E., 931
Cruz, E. E., 1327
CSIRO, 466, 655, 1084
Čuhnin, Ju. A., 914
Culbertson, J. O.,909
Culbertson, R. E., 171
Cullen, J. C., 151
Culpin, S., 1292
Cunningham, D. K., 1196
Cunningham, R. H., 1325
Curtis, J. T., 1426
Dadd, C.V., 917, 1269
Dadykin, V. P., 1079
Dakshinamurti, K., 100
Dales,H., 284
Dalmeyer,W.H. M., 851
Dal Monte Casoni, P., 1259
Daniel, G. H., 34, 1191
Daniels, N. E., 1085
Danielson, R.E., 1117, 1133
Danjo, T., 41
Dantuma, G., 294
Dark, S. O. S., 903
Das, B. K., 555
Da Silva, J. B. V., 1129
Dastur, R. H., 1318
Datta, A. N., 556
Davies, G. M., 1088
Davies, R. O., 35
Davis, J. F., 1237
DeBruyn, J. A., 1159
De Caestecker, K., 2
Decker, G. C., 23
Deems, R. E., 853
Degras, M., 773
Deguchi, M., 89, 382
De Leenheer,L., 2
De Meester, J., 1317
Deming, G. W., 863
De Miranda, J., 294
D'Emmerez de Charmoy, A., 1216
Denmark
Roy. Agric. Soc., 279
Stat. Forsøgsvirk. Plantekult., 549
De Oliveira, A. J., 1414
Departments of Agriculture—see countries
Dep. Publ. Lands, Qd, 219, 573
Derenne, P., 128
Derscheid, LA., 952
Desveaux, R., 561
Detroux, L., 488
Devreaux, M., 877
De Zeeuw, D., 816
Dieudonné, P., 1103
Dimmock, F., 462
Di Prima, S., 1415
Dir. Agric. For. Morocco, 686
Dir. Agric. Ganad. Mexico, 387
Dirven, J. G. P., 82
Dona dalle Rose, A., 1245, 1259
Donovan, P. A., 412
Dore, J., 434
Dörner, H., 1203, 1204
Dorph-Petersen, K., 890
Draper, C. I., 912
Dregne, H. E., 1319
Dreier, A. F., 1202
Dua, D. B., 555
Dubetz, S., 863, 1342
Dubois, L., 593
Duff, A. D. S., 20, 22
Dulac, J., 295, 411, 707
Duley, F. L., 937
Dungan, G. H., 394, 396, 1092
Dunham, R. S., 752, 942
Dunk, W. P., 239, 240
Du Pasquier,R., 772
Du Plessis, J. P. J., 300
Duvick, D. N., 407
Dyer, R. A., 1403
Dyke, G. V., 865
Dyke, I. J., 1402
Dymond, J. A., 987
East Africa Agric. and For. Res. Org., 1027
East Afr. Roy. Comm., 1026
Eberhardt, F., 369
Edelman, C. H., 586
Eden, W. G., 886
Edinburgh and East Scot. Coll. Agric., 1021, 1256
Edmond, D., 675
Edwards, G. H. A., 1291
Eeuwens, B. E. P., 586
Egorov, V. F., 391
Eguchi, H., 782
Egypt Minist. Agric., 676, 1163
Ehrendorfer, K., 503, 511
Eich, D., 961

Eidg. Landw. Versuchsanst. Zürich-Oerliken, 1023
Ekbote, R. B., 15
Ekstrand, H., 953, 1197
Eliasson, L., 24, 1080
Eliasson, S., 1100
Elliot, J. G., 1091
Elliott, C. S., 1003
Elliott, I. L., 675
El Shafei Ali, M., 1391
Elsken, R. H., 879
Emilsson, B., 885, 1295
Emp. Cott. Gr. Corp., 191, 192, 193, 543, 544, 545, 546, 1320, 1321
Ennis, W. B., 317
Enomoto, N., 776
Enzmann, J., 1390
Erkamo, V., 1387
Erlanson, C. O., 317
Ernould, L., 1247
Erroux, J., 339
Esch, J. A. H., 1038
Eunus, A. M., 377
European Brewery Convention, 56, 1101
Evans, H. J., 986
Evelyn, S. H., 938
Everson, E. H., 1312
Fail, H., 944
F. A. O., 289, 316, 662, 920
Fazullah Kahn, K., 1167
Fed. Agric.-Chem. Res. Sta., Liebefeld-Bern, 1024
Federov, A. K., 803, 1077
Feekes, F.H., 248
Fenwick, D. W., 1417
Ferens, P. S., 675
Fernando, H. E., 84
Fernando, L. M., 92
Ferrand, M., 1221
Ferrarini, E., 250
Fitch, B. J., 413
Fiddian, W. E. H., 1072
Findlen, H., 168
Fink, E., 409
Fink, H. C., 871
Finney, D. J., 1431
Fischbeck, G., 1102
Fischer, H. 1239
Fischnich, O., 1296
Florida Agric. Exp. Sta., 652
Floyd, E. H., 887
Fm Impl. Rev., 1014
Fmg in S. Afr., 1274
Folkes, B. F., 376
Foltýn, J., 332
Forbrother, H. G., 807
Fort Hays Br. Sta., Kansas, 1025
Foster, G. H., 414
Fournier, F, 587, 1356
Fowden, L., 117, 261, 472
Fox, R. L.,1009
Foy, C. D., 758
Foy, C. L., 184
Franc de Ferrière, P. J.-J., 618
France
Inst. Nat. Rech. Agron., 295, 648
Inst. Rech. Huiles, Oléagineux, 606, 615, 618, 635
Frank, S. 756
Frankenwald Fld Res. Sta., 301
Frankton, C., 598
Frauendorfer, S., 630
French, M. H., 175
Frese, H., 138
Frey, K. J., 43, 717
Fritz, G., 970
Fuchs, S., 1395
Fujiwara, A., 447, 730, 778, 779
Fujizuka, S., 918
Fulton, J. M., 1263
Fults, J. L., 1294
Funke, H., 755
Fursa, N. T., 390
Furunes, J., 335
Fussell, G. E., 275
Gachon, L., 295
Gadd, I., 363
Galeev, G. S., 67
Gall, H., 1266
Gandhi, R. T., 812
Gangulee, H. C., 1178
Gannon, N., 23
Garderen, J. van, 760
Gardner, H. W., 31
Gardner, R., 1341
Garrard, A., 257
Garton, J. E., 931
Gates, L. F., 1417
Genter, C. F., 740
Geortay, G., 433
Germany, Inst. Landtechnik, 808
Geroev, M. Ja., 398
Geslin, H., 648
Gfeller, F., 997
Ghosh, A. K., 653
Ghosh, A. N., 522
Ghosh, B. N., 202, 558
Gibbs, M., 832
Gibson, K. E., 873
Giffard, E. G., 72
Gifford, E. M., Jr., 733
Gigante, R., 157
Gilbert, D., 582
Gill, W. R., 252, 1382
Gilles, A., 877
Gillier, P., 473
Gingrich, J. R., 1134
Gisiger, L., 919
Glover, J., 641
Gloyne, R. W., 228
Glue, D. I., 675, 949
Glynne, M. D., 1073, 1417
Godard, M., 648
Goedewaagen, M. A. J., 1383
Goerlitz, H., 504
Goffart, H., 526
Gold Coast Dep. Agric., 1419
Golovin, P. V., 179
Golubchuk, M., 1209
Golubeva, P. F., 552
Gomez, J. A., 213
Gonzalez, G., F., 709
Goodchild, D. J., 1230
Goodhue, L., 1306
Goodman, A., 186, 902
Gopal, R., 241
Gordon, R. B., 675
Gordon, S. A., 626
Gorringe, S., 364
Gorter, G. J. M. A., 402
Gosi, L., 743
Gota, Y., 1183
Gott, M. B., 1099
Gould, G. E., 747
Gouny, P., 295, 984
Gradin, H., 101
Grafius, J. E., 45
Graham, G. J., 70
Grainger, J., 94, 509
Gram, E., 286
Grassi, U., 386
Grassl. Res. Inst., 1404
Gray, S. G., 466
Great Britain
Brit. Weed Contr. Coun., 1374
Colon. Agric., Anim. Health, For. Res.Cttee, 1406
Colon. Office, 217
Colon. Prod. Coun., 1407
Commonw. Econ. Cttee, 306
Edinburgh and East Scot. Coll. Agric., 1021, 1256
Emp. Cott. Gr. Corp., 191, 192, 193, 543, 544, 545, 546, 1320, 1321
Grassl. Res. Inst., 1404
Hasler and Co., Ltd., 645
Home Grown Threshed Peas Joint Cttee, 1228
Jealott's Hill Res. Sta., 1405
Macaulay Inst. Soil Res., 963
Minist. Agric., Fish., Fd, England and Wales, 631, 632, 827, 1041
NAAS, 631, 632
Nat. Veg. Res. Sta., 1261
NIAE, 690, 723, 809, 1109
Norfolk Agric. Exp. Sta., 644
Rothamsted Exp. Sta., 235, 1417
Rural Reconstruct. Ass., 312
Shell Chem. Co., Ltd., 1040
Town and Country Plann., 210
Greaves, D. W. B., 1292
Greece
Cott. Res. Inst., 534
Hellenic Agric. Res. Sta., 1001
Green, H. C., 884, 1297
Green, J. M., 1322
Greenwood, C. T., 42
Greer, E. N., 16
Gregg, A. S., 6, 7,
Gries, G. A., 705
Grifoni, E., 685
Grigsby, B. H., 947
Grillot, G., 18, 291
Grillot, M. G., 734
Grillot, M., 735
Grimaldi, A., 486
Grindley, D. N., 131
Grogan, C. O., 1116
Gros, D., 115
Groskreutz, —165
Grossheim, A. A., 307
Guennelon, R., 589
Guernier, M., 771
Günther, E., 620
Günzel, G., 268
Gustafson, G. F., 268
Gutknecht, J., 535, 541
Hac, L. R., 1255, 1260
Hackbarth, J., 1236
Hacke, F., 520
Hackman, R. H., 1397
Haddock, J. L., 1260
Hafuzullah Husani, S., 530
Hagenzieker, F., 1350
Hagsand, E., 97, 553
Hakimov, K., 181
Halkias, N. A., 1386
Ham, G. F., 395
Hamblin, H. J., 809
Hameed, A., 893
Hamid, A., 346
Hamilton, J., 1305
Hamm, P. C., 1371
Hamner, C. L., 30

Hanada, K., 692
Hanley, F., 1000
Hanna, W. J., 989
Hannah, A. E., 1325
Hänsel, H., 19, 294, 333, 698, 1076
Hansen, D. R., 911
Haq, A., 435
Haranjan, N. N., 1067
Harper, J., 403
Harper, J. L., 745, 1126
Harris, L., 863
Harrison, G. H., 304
Harrold, L. L., 1136
Hart, J., 1337
Hartman, R. E., 507
Harward, M. E., 1289, 1290
Hashimoto, T., 469
Hasler and Co., Ltd., 645
Hattingh, I. D., 750
Haylett, D. G., 1140
Haynes, D. W. M., 1187
Haynes, J. L., 1121
Hayward, P. R., 645
Heath, R. G., 1421
Heathcote, G. D., 1417
Hebblewaite, P., 245
Hebert, T. T., 725
Heermann, R. M., 688
Hefti, J., 288
Heinisch, O., 136
Heintze, S. G., 1226
Heinze, P. H., 518
Helburn, N., 220
Helgesen, E. A., 943
Hellbo, E., 368
Hellenic Agric. Res. Sta., 1001
Heller, C., 848
Hellström, N., 1331, 1332, 1333
Hemingway, R. G., 992
Hemming, H. G., 125
Henderson, J. L., 35
Henkelj, P. A., 404, 1124
Hermansen, J. E., 1002
Hernaez, A., 1300
Hewitt, E. J., 975, 979
Heydecker, W., 1377
Higgs, E. D., 583
Highkin, H. R., 833
Hill, H., 881
Hills, F. J., 861, 863
Hilton, R. J., 1287
Hiroux, G., 1257
Hitchcock, A. E., 998
Hobbs, J. A., 1343
Hodge, W. H., 317
Hodgson, H. J., 713
Hoffpauir, C. L., 1396
Hofmann, E., 721
Hogaboam, G. J., 862, 863
Hogan, J. T., 451
Hogman, W. G., 875
Holliday, R., R.A. pp. 129, 207
Holly, M. A., 1036
Holmberg, S. A., 811
Holmes, R. S., 977
Holst, E. M., 855, 963
Holz, W., 954
Home Grown Threshed Peas Joint Cttee, 1228
Honert, T. H. van den, 410
Hooker, A. L., 746
Hooymans, J. J. M., 410
Hoppe, P. E., 69
Horber, E., 55
Hore, H. L., 3
Horita, R., 918
Horváth, A., 283
Howald, O., 922
Howe, O. W., 1135
Hughes, L. C., 544
Hunt, J. L., 951
Hunter, J. S., 1019
Hurwitz, S., 575
Hüser, R., 267
Huston, J. J., 940
Hutchinson, A., 1287
Hutter, W., 1139
Hutton, J. T., 1186
Hyche, L. L., 886
Hyde, T. G., 480
Hyer, A. H., 182, 891
Hyre, R. A., 505
Ichinohe, S., 588
Ihm, P., 642
Iida, S., 778, 779
Iljin, W. S., 635, 1157
Iljina, A. I., 910
Inada, K., 788
India
  Agric. Inst. 653
  Cent. Cott. Cttee, 547
  Cent. Jute Cttee, 906, 907
  Cent. Rice Res. Sta., 452
  Coun. Sci. Industr. Res., 305
  Inst. Pl. Industr., 654
Indian Fmg, 431
Indiana Agric. Exp. Sta., 747
INEAC, 1018, 1034
Inouye, C., 119
Inoue, T., 129
Inoue, Y., 824
Inst. Agron. do Sul, 290
Inst. Internat. Rech. Betterave, 135
Inst. Landtechnik, 808
Inst. Nat. Rech. Agron., 295, 648
Inst. Pl. Industr., 654
Inst. Rech. Huiles, Oléagineux, 606, 615, 618, 635
Inter-Afr. Soils Conf. 1954, 760, 929
Internat. Bank Reconstr. Devel., 658
Internat. Crop Improve. Ass., 285
Ireland
  Northern
    Agric. Res. Inst., 646
    Minist. Agric., 9, 38, 51, 142, 292, 373, 500
  Republic of
    Dep. Agric., 454, 647, 1192, 1193
    Minist. Agric., 140, 293, 1022
Irlenbusch, J., 681
Irving, H., 888
Isbell, R. F., 219, 573
Ishizawa, S., 485
Ishizuka, Y., 91, 371
Italy. Inst. Allev. Veg. Cerealicolt., 95
Ivens, G. W., 1367
Ivy, E. E., 185
Jacks, H., 70
Jackson, W. A. D., 923
Jacobsen, G., 1100
Jacobsen, I., 1006
Jacobson, H. G. M., 1122
Jacobson, L., 378
Jähnl, G., 141, 170
Jahtenfeljd, P. A., 1
Jamaica Dep. Agric., 651
Janes, B. E., 415
Jansson, S. L., 835
Jaschik, S., 514
Jastrebov, M. T., 701
Jawetz, M. B., 566
Jaworski, E. G., 601, 1369
Jealott's Hill Res. Sta., 1405
Jensen, M. C., 1348
Jodon, N. E., 428
Johnson, C. M., 976
Johnson, I. J., 374
Johnson, L. P. V., 724
Johnson, M. P., 957
Johnston, W., 675
Johnston, W. B., 1253
Jones, G. H. G., 925
Jones, K. W., 1364
Jones, P. J., 1111
Jonge Poerink, H. J., 82
Jönsson, A., 477
Jordan, H. V., 1141
JordbrTekn. Inst., Sweden, 101, 476
Joyce, R. J. V., 898
Jungehülsing, H., 397
Justus, N., 36
Kajjari, N. B., 1149
Kaku, S., 112, 113
Kaleski, L. G., 592, 941
Kalyanikutty, T., 792
Kamata, E., 437
Kanaš, M., 187
Kandiah, S., 164
Kandler, O., 409
Kannan, R., 1167
Kansas Agric. Exp. Sta., 1025, 1143
Kar, A., 845
Karimullah,—, 893
Karlsson, B., 24
Karon, M. L., 451
Karper, R. E., 418, 1152
Kartha, A. R. S., 206
Kartin, K. H., 1349
Karulis, Ja. Ja., 62
Kasai, Z., 356, 565, 1334
Kasasian, L., R. A., p. 1
Kasperlik, H., 599
Katalymov, M. V., 619
Kato, I., 110
Katznelson, H., 1380
Kaushal, P. K., 15
Kavanagh, L. R., 64
Kawamura, S., 836, 837, 838
Kaziev, T., 1316
Keller, C., 13
Kelley, O. J., 1260
Kelly, A. F., 96
Kennedy, A. L., 756
Kenten, R. H., 259, 1417
Kenya Dep. Agric., 649, 1028
Kerr, W. E., 1013
Khan, S., 768
Khunte, P. D., 1154
Kibasov, P., 224
Killough, D. T., 892
Kinbacher, E. J., 1060
King, J. R., 1279
King, K. M., 496
Kirillova, G. A., 344
Kirk, V. M., 1131
Kirkpatrick, M. E., 169
Kitamura, E., 438
Kiyosawa, S., 790
Kjaer, A., 286
Klauss, M. L., 1078
Klintworth, H., 929
Klitsch, C., 453, 719
Klykov, A. P., 815
Knowles, P. F., 203

Kobayashi, M., 870
Kochan, W. J., 696
Kodama, T., 172
Koerner, A.C., 519
Kogane-Charles, M., 561
Kolk, H., 560
Koller, D., 1375
Kommedahl, T., 909
Könnecke, G., 1340
Konovalov, I. N., 260
Koppers-Sonnenberg, G. A., 180
Korol, N., 222
Korsmo, E., 1429, 1430
Kortleven, J., 163
Koshiry, A., 1163
Kosinskiĭ, V. S., 928
Kostrubin, M. V., 699
Krall, A. R., 380
Krantz, A., 863
Kress, H., 495, 1113
Kreyger, J., 294
Kriegbaum, H., 680
Krüger, F. H., 1020
Kudo, K., 588
Kulash, W. M., 761
Kulkarni, Y. S., 542
Kumar, K., 516
Kundu, B. C., 196, 1326
Kurth, H., 843
Kurup, P. G., 232
Kuzjmenko, F. K., 392
Kuznecov, G., 215
Kuznecova, M. S., 702
Labanauskas, C. K., 1092
Lacroix, L., 1090
Lagière, R., 540
Lakon, G., 256
Lal, K. N., 383, 729, 804
La Molina Esta. Exp. Agric., 341, 506, 508, 538
Landragin, P., 1126
Langston, R., 603
Larin, I. V., 1007
Larose, E., 1065
Larson, A., 549
Larson, W. E., 860, 863, 1253
Larter, L. N. H., 774
Laske, P., 857
Laude, H. H., 1143
Laudelout, H., 189
Laumont, P., 463, 722
Lavoura arroz., 1173
Lawes, D. A., 894
Lawrence, E. N., 227
Lawrence, W. J. C., 1400
Laws, W. D., 1063
Lazarus, M., 1397
Leben, C., 54, 1412
Lechner, L., 484, 847
Leenheer, L. de, 2
Lefevre, G., 1257
Lehane, J. J., 330, 682, 1354
Leiderman, L., 754
Lein, A., 1376
Leopold, A. C., 816
Le Tourneaux, D., 1288
Leukel, R. W., 765
Lévégue, M., 825
Lewis, A. H., 278
Lilly, J. H., 814
Lindenbein, W., 456
Lindenmayer, A., 268
Lindner, K., 514
Lindsay, D. R., 1358
Linnik, G. N., 510
Little, E. C. S., 675, 960
Livens, J., 708
Livingston, J. E., 98
Llavería B., M., 506
Lochhead, A. G., 1381
Lochow, J. v., 1020
Löhrke, L., 1303
Long, W. G., 1389
Louis-Marie (Père), 237
Low, A., 544
Lubatti, O. F., 1227
Lüddecke, F., 1262
Lüders, R., 267
Luthra, J. C., 695
Lutz, J. M., 521
Lynch, P. B., 675
Lyttleton, J. W., 971
McAllister, J. S. V., 142
McCallum, E. S. R., 991
McCann, J. Mc., 710
Macaulay Inst. Soil Res., 963
McConaghty, S., 142
McCree, K. J., 609
McDonald, A. N. C., 1205
MacGregor, J. M., 1097
McGregor, W. G., 911
Machacek, J. E., 458
Macht, D., 47
Maciejewska-Potapczyk, W., 600
McIlrath, W. J., 900, 1159
McIntosh, T. P., 715
McIntyre, D. S., 343
McKee, H. S., 124, 834
McKee, J. G., 675, 751
MacKenzie, A. J., 863
MacKey, J., 353, 366
MacLean, S., 675
McLennan, L. W., 677
MacMillan, W. G., 554
McNeal, F. H., 349
Madec, P., 1283
Maeda, K., 119
Mahapatra, L., 516
Maisurjan, N. A., 107
Majmudar, J. V., 1154
Malavolta, E., 1138, 1301
Malaya, Fed. of, Dep. Agric., 774, 1408, 1421
Maliani, C., 14
Malone, J. P., 1010
Mann, L. K., 1299
Mann, P. J. G., 259, 1417
Manning, H. L., 1016, 1409
Mantari C., C., 525
Mantovani, G., 1249
Mapson, L. W., 831
Marani, A., 550
Marchal, A., 825
Margheritis, A. E., 551
Marie, R., 767
Martin, J. P., 317
Maruta, H., 784
Mata, J. P., 78
Mateer, C. L., 1410
Mathieson, I., 1080
Mathieu-Reverdy, G., 58
Mathis, W. T., 1399
Mathon, C. C., 28
Mathur, P. B., 1223
Matsubayashi, M., 44
Matsushima, S. 443, 785, 786
Matthaei, G., 499
Matthews, L. J., 675
Matuda, E., 524
Maughan, G. L., 135
Maume, L., 295
Maupas, A., 399
Maxwell Darling, R. C., 633
Mayer, R., 286
Mazoyer, R., 295
Mazzani, B., 201, 205, 1335
Meadly, G. R. W., 595
Mederski, H. J., 818
Meenakshisundaram, D., 597
Meester, J. de, 1317
Meggitt, W. F., 1213
Meidner, H., 605
Meljnik, T. D., 1125
Mello-Sampayo, T., 83
Meschkat, H., 620
Mexico
  Dir. Agric. Ganad., 387
  Sec. Agric. Ganad, 68, 417
Mia, A. J., 905
Migahid, A. M., 1391
Mihaleva, E. N., 260
Mihalovskiĭ, A. G., 1125
Milatz, R., 286
Miles, S. R., 1142
Millar, C. E., 314
Miller, H. F., 190
Miller, J. D., 331
Miller, J. G., 810
Miller, L. I., 118
Miller, R. D., 1382
Miller, W. M., 863
Millington, A. J., 5
Milthorpe, F. L., 1385
Ministries of Agriculture—see individual countries
Minnesota Agric. Exp. Sta., 1097
Miranda, J. de, 294
Misra, G., 87, 440, 441, 442, 781, 1179
Misra, M. D., 360
Mišustin, E. N., 533
Mitchell, F. S., 690, 1109
Mitchell, J. W., 950
Mitchell, R. L., 617
Mitrofanov, A. S., 226
Mitsui, S., 663
Miyaji, Y., 75
Moës, A., 1103
Mohanty, G. C., 1189
Montaldi, E. R., 512
Montanari, V., 337
Montgomery, F. H., 1359
Montilla, J. A., 1310
Moore, W. C., 1411
Morgan, L., 1042
Morgan W. B., 576
Mori, T., 85, 1181
Morimoto, I., 425
Morinaga, R., 88
Morris, G. P., 50
Morris, L. M., 1299
Mort, G. W., 939
Moškov, B. S., 904
Mosolov, I. V., 988
Moss, H. J., 4
Mostafa, M. A., 1314
Mota, S. da, F., 1118
Motohiro, K., 846
Mouat, G. C., 309
Moulsley, L. J., 996
Mountier, N. S., 810
Moursi, M. A., 147
Moustafa, E. M., 831
Mulder, E. G., 805, 880
Müller, H., 1113
Müller, K. O., 155

Swanson, C. L. W., 1122
Sweden
  JordbrTekn. Inst., 101, 476
  Stat. Vaxtskyddsanst., 953, 1197
Swezey, A. W., 1313
Switzerland
  Eidg. Landw. Versuchsanst., Zürich-Oerlikon, 1023
  Fed. Agric.-Chem. Res. Sta., Liebefeld-Bern, 1024
Szokolay, G., 770
Tagawa, T., 160
Tai, K., 1183
Takagi, S., 1182
Takeda, T., 784
Talukdar, S., 557
Tamm, E., 29, 755, 1388
Tamura, T., 446
Tanaka, A., 91
Tanaka, M., 86
Tanganyika Dep. Agric., 1030
Tano, K., 870
Tarr, S. A. J., 899
Tasmania Dep. Agric., 1422
Tavernetti, J. R., 190
Tchan, Y. T., 1392
Teas, H. J., 749
Terayama, Y., 79
Teunisson, D. J., 795
Texas Agric. Exp. Sta., 892, 935, 1357
Thaine, R., 608
Thakur, C., 1199
Thatcher, L. E., 1121
Theron, J. J., 1140
Thiegs, B. J., 243
Thielebein, M., 286
Thomas, A. J., 613
Thomas, C. A., 908
Thomas, N. F., 173
Thomas, W., 1114
Thompson, E. G., 487, 1240
Thompson, F. B., 675, 956
Thompson, J. H., 450
Thorne, G. N., 359, 858, 1417
Thorpe, H. C., 20, 799, 800
Throneberry, G. O., 748
Thurman, R. L., 36, 1144
Thurston, J. M., 235, 1417
Tidbury, G. E., 1185
Till, J. F., 675
Tinarelli, A., 429
Tisdall, A. L., 239, 240
Tizio, R. M., 502
Toffe, J. S., 317
Togari, Y., 787
Tomita, Y., 176
Toms, A. M., 580
Tonnard, V., 221
Torssell, B., 1332, 1333
Torstensson, G., 835
Tourte, R., 825, 930
Town and Country Planning, 210
Toyoda, H., 485
Treadway, R. H., 167
Trickett, E. S., 996
Trocmé, S., 615
Troyer, J. R., 33
Tsutsumi, M., 447, 730
Tuite, J. F., 1112
Tyner, L. E., 375
Ueki, K., 79
Uganda Dep. Agric., 1029
Ulrich, A., 491, 1251, 1260
UNESCO, 310
Unger, K., 934
UNKRA, 662
USA
  Amer. Soc. Sug. beet Technol., 863, 1260
  Arkansas Agric. Exp. Sta., 936
  California Agric. Exp. Sta., 190
  Colorado Agric. Exp. Sta., 1341
  Dep. Agric., 311, 1044
  Florida Agric. Exp. Sta., 652
  Internat. Crop Improve. Ass., 285
  Kansas Agric. Exp. Sta., 1143
  Kansas, Fort Hays Br. Sta., 1025
  Minnesota Agric. Exp. Sta., 1097
  New Jersey Agric. Exp. Sta., 989
  Oklahoma Agric. Exp. Sta., 931
  Purdue Agric. Exp. Sta., 747, 1142
  South Dakota Agric. Exp. Sta., 952
  Texas Agric. Exp. Sta., 892, 935, 1357
  Utah Agric. Exp. Sta., 912
Vachhani, 436
Van Baer, R., 1417
Van den Bruel, W. E., 1206
Van den Honert, T. H., 410
Vandenplas, A., 1061, 1062
Van der Walt, J. L., 594
Vanecko, S., 982
Van Garderen, J., 760
Van Rensburg, J. A., 300
Van Steyvoort, L., 1238
Varela M., R., 1106
Varenik, I. P., 405
Vargas, V. M., 17
Varner, J. E., 982
Vartapetjan, S. M., 1286
Vasconcellos, J. de C.e., 81
Veenbaas, A., 121
Veličko, E., 1164
Venezuela, Cent. Invest. Agron., 73
Viale E., 173
Vicente, J. R., 876
Vidéki, L., 878
Vidme, T., 602
Vigorov, L. I., 694
Villanueva N., R., 341
Villena, L. M., 251, 1104
Vince, D., 993
Vink, A. P. A., 211
Virgin, H. I., 607
Vogl, H., 1351
Volleïdt, L. P., 988
Vömel, A., 1235
Vorkačev, G. G., 679
Vorster, P. W., 300
Wada, J., 86
Wadleigh, C. H., 317
Wagner, F., 49
Wagner, S., 684
Waite Agric. Res. Inst., 302
Walhood, V. T., 1309
Walker, C., 675
Walker, E. R., 691
Wallace, A., 1110
Wallace, A. T., 718
Wallace, T., 621
Wallen, V. R., 123
Walsh, T., 1051
Walstedt, I., 683
Walt, J. L. van der, 594
Walter, H., 1017
Walters, M. C., 608
Wangerin, R. R., 1370
Ward, R. K., 675, 693
Warington, K., 624, 1417
Warner, M. G. R., 457
Warren, F. S., 462
Warren, G. F., 244
Warren, L. E., 852, 863
Watabe, T., 769
Watanabe, K., 255
Waterson, H. A., 372
Watson, A. J., 1311
Watson, D. J., 359, 849, 858, 1417
Watson, M. A., 1417
Wauthy, R., 488, 1241
Way, J. M., 840
Way, M. J., 1417
Wear, J. I., 1158
Webb, J. A., 117
Weber, G., 1108
Weber, R. P., 626
Wehrle, V. M., 1074
Weiss, M. G., 465
Wellington, P. S., 689
Wenner, H. L., 808
Went, F. W., 1250, 1260
Wenzl, H., 1277
Werner, H. O., 146
West Afr. Maize Rust Res. Unit., 401
West Afr. Rice Comm., 93
West, S. H., 1225
Wheeler, E. J., 145
Whitaker, W. O., 1401
White, P. L., 208
Whiteside, J. O., 483
Widdowson, F. V., 806, 1417
Wiese, A. F., 942
Wiggans, S. C., 43, 712, 717
Wiklund, K., 122, 280
Wild, H., 924, 1427, 1428
Willard, C. J., 395
Willcox, O. W., 628
Wille, J. E., 538
Williams, E. J., 1280
Williams, R. F., 731
Williams, R. H., 948
Williams, R. M., 994
Willimott, S. G., 1345
Wills, P., 1184
Wilson, A. R., 1298
Wilson, J. H., 818
Wilson, J. W., 416
Wilson, K. S., 659
Wilson, L. R., 952
Wilson, W., 1184
Wilson-Jones, K., 764, 1364
Wiltse, M. G., 1229
Winslow, R. D., 133
Wishart, J., 315
Wolcott, G. N., 523
Woodford, E. K., R.A. p. 1
Woodward, R. W., 1190
Wright, A. H., 69
Wright, K E., 981
Yahiro, M., 129
Yamada, N., 783, 791
Yamamoto, K., 85
Yamamoto, Y., 176
Yatazawa, M., 357
Yeates, J. S., 675, 955
Yemm, E. W., 376
York, E. T., 757
Youden, W. J., 1019
Young, D. A., 1268
Young, H. C., 853
Yule, A. H., 1224
Záborský, J., 866
Zafar, M. A., 161
Zagoroff, Z. D., 313
Zaharževskiĭ, A., 11

lenskiĭ, O. V., 972
liki, T., 449
nini, E., 1242
nzibar Dep. Agric., 178, 650
euw, D. de, 816
Zerov, D. K., 308
Zimmerman, P. W., 998
Zimmermann-Griess, S., 1270
Zjusjko, Ja. G., 1
Zucchino, M., 336
Zuev, L. A., 552
Zunino, H. A., 901
Zurbickiĭ, Z. I., 1286
Zweifel, J., 13
Zwijns, M. J., 248

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97
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